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NAVAL POLICY

A PLEA FOR THE STUDY OF WAR

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BY

"BARFLEUR"

"It is for the past and the future that we must work: for the past, to acknowledge its merits: for the future, to try to increase its value."—GOETHE.

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This Volume is Dedicated

TO THE

MEMORY OF THE LATE

VICE-ADMIRAL PHILIP H. COLOMB,

WHOSE

DISINTERESTED LABOURS IN THE SERVICE OF HIS COUNTRY HAVE NEVER RECEIVED ADEQUATE RECOGNITION EITHER FROM THE NAVY OR FROM THE NATION.

INTRODUCTION.

THIS volume contains a number of articles which have appeared in 'Blackwood's Magazine,' in Brassey's Annual, and in the 'Morning Post' during the past two years. The earlier ones were not written with any idea of publication in book form, which explains their somewhat disconnected shape. While wanting in symmetrical arrangement, the whole series is dominated by the great central idea that war is the end and aim of a military navy, and that whether it be in education or in shipbuilding, correct conclusions are only to be found by recognising this fundamental truth.

The reader is to observe that the naval mind is divided into two schools—the historical and the *matériel*. The adherents of the one appeal for guidance to the great masters of the art of war by sea and land; they hold that it is very important to study tactics and strategy by the light of history. The disciples of the

other do not believe the lessons of the past are applicable to the present; they have neglected the study of tactics and strategy, and have devoted their energies to the development of the *matériel*—ships, guns, armour, &c.

The struggle between the two lines of thought began some forty years ago. The *matériel* school were then and are still dominant, but the historical school have been slowly advancing. In the year 1887 the Intelligence Department was started, and thirteen years later another notable step was gained. The "war course" was opened at Greenwich College in the year 1900, and the systematic study of war then began. To the Board over which Lord Goschen presided, with Lord Walter Kerr as First Sea Lord, is due the credit of that great and far-reaching departure, which was taken none too soon. The South African War, followed by that between Russia and Japan, concentrated attention on the realities, and forced the Navy to face problems long pressing for solution, but hitherto kept in the background. To the *matériel* school, who had not studied war, passed the task of dealing with them. The action taken, combined with the explanation afforded by a number of official memoranda, exposed to view the general drift of their policy. This insight had an exceedingly disquieting effect on many of those who

had long studied such questions. Their anxiety was not reduced by the action taken by the Press. A reply to the current erroneous views was urgently called for. It is for the reader to determine whether the anxiety was justified.

The problems to be solved demanded thorough treatment at the hands of a great statesman. If the executive-engineer amalgamation had been so dealt with, would it now be in its present uncertain state? Would the proposal to change the character of the Royal Marines ever have been made? Would the indiscriminate scrapping of ships have been carried so far? Would the necessity for any ship between the capital ship and the destroyer have been denied and afterwards admitted by the announcement of the intention to lay down an unarmoured cruiser under another name? Would an inordinate value have been attached to speed, with the corresponding sacrifice of fighting power?

These questions have been treated at length in the present work, with the view of calling attention to the dangers likely to accrue if the teachings of History are neglected and the doctrines of the *matériel* school are accepted.

"BARFLEUR."

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NAVAL POLICY:

A PLEA FOR THE STUDY OF WAR.

I.

ADMINISTRATION.[1]

THE triumvirate appointed in 1903-4 to frame a new scheme for the government of the Army were directed to take the Admiralty system of higher administration as the basis of their action, on the plea that, although there might be imperfections in its working, it was at the time sound in principle. As important changes have since been made in the working of the Admiralty, it may be interesting to explain not only those changes, but also the difference between the organisation of the present Admiralty and of that which carried on the great maritime wars of the past.

Previous to the year 1546 the Navy was not governed on any broad and comprehensive

[1] Blackwood's Magazine, May 1905.

principle. The Lord Admiral ruled it, but no recognised organisation existed to supply its wants, which were dealt with in more or less haphazard fashion as they arose. The increase in the Navy during the reign of Henry VIII. showed the necessity of reform, and in the year mentioned a Board of Principal Officers, subordinate to the Lord Admiral, was formed to supply the needs of the sea service. This great departure established the sound principle that political and executive control should be superior to, but separate from, administration,—that those charged with the direction or conduct of war operations should be relieved from the details involved in providing the ships, armament, stores, &c., with which to carry it on.

The political and executive authority originally centred in the Lord Admiral passed at various times to the King and Council, to a Parliamentary Committee, to the Lord High Admiral, to the King, and finally to the Board of Admiralty, with whom it remained throughout all the great maritime wars from the end of the seventeenth century to the downfall of Napoleon. It was never exercised to the full extent by the Board of Principal Officers or Navy Board, which was limited to the administration of the supply services.

In its broad features the system became analogous to that under which the German army is

believed to be administered at the present time. The present over-centralised administration of the *personnel* did not then exist, and the work of the Admiralty Board was of the nature of that done jointly in Germany by the Emperor, the Military Cabinet, and the great General Staff, while the business of the Navy Board corresponded with that dealt with by the German War Office.

The Navy continued to be administered on this broad principle for nearly three centuries. In course of time the Navy Board, and other civil departments which had gradually grown up, became so inefficient and unmanageable that the whole system was thrown into discredit. Reform became necessary, and unfortunately Sir James Graham, who undertook it in 1830, was not alive to the great underlying principle which had carried the Admiralty with success through more than one great war. He threw it altogether on one side, abolished the Navy Office, and brought all the civil departments under the Admiralty Board directly, organising them under the individual responsibility of five principal officers, viz. :—

Surveyor of the Navy.
Storekeeper-General.
Controller of Victualling.
Medical Director-General.
Accountant-General.

Each principal officer was superintended by a Lord of the Admiralty, who brought before the Board such matters of importance connected with his department as required a Board decision. The fatal defect in the arrangement was that all the Lords of the Admiralty were brought directly in contact with questions of supply. Their attention was diverted from their proper *rôle* — the conduct of war — to details connected with *matériel*. It was a peace organisation.

The arrangement was specially pernicious in the case of the First Sea Lord, who, as the Lord supervising the Surveyor of the Navy, was brought more immediately in contact with the dockyards and ship construction. The evil effect assumed more importance when wooden sailing-ships gave place to armoured steamers, as it tended to concentrate his attention on details connected with ships, guns, and armour, and to divert him from his true *rôle* of directing the thought of the service to the best methods of using the new weapons introduced.

The difficulty of conducting a business of so much complexity gradually increased as the revolution in *matériel* proceeded. The Admiralty machine showed signs of much internal friction. It became impossible to intermingle the large and far-reaching questions involved in preparing

for, and conducting, a maritime war with those equally difficult, but widely different, problems included in the provision of ships, their armaments and stores. This difficulty seems to have been to some extent realised by Mr Childers, who reorganised the Admiralty under the Order in Council of January 14, 1869, and divided the work into three principal branches :—

A. Business relating to the *personnel* and to the movements and condition of the fleet.
B. Business relating to the *matériel*—*i.e.*, to the building and repairing of ships, to guns, and to naval stores.
C. Finance.

The division of the business was correct in principle, and was similar in its broad features to that under which it was conducted by the Admiralty and Navy Boards, before the changes made by Sir James Graham. Under A are included the two main questions upon which turn the conduct of war :—

1. The distribution of the fleet or fighting force, which depends upon policy.
2. The selection and training of the *personnel*, which is the governing factor in war.

Under B are placed all questions connected with the supply of *matériel* of all descriptions.

A may be said to be "the soul" from which B "the body" derives life and inspiration.

Mr Childers does not seem to have understood, or appreciated, the magnitude, complexity, and importance of the many questions involved in the conduct of war, since he placed A nominally on an equal footing with, but really on a lower level than, B. A was represented by two Sea Lords, but as they were not assisted by a professional staff of any kind, tactical and strategical questions were not adequately studied, and the information at their disposal was altogether insufficient to enable them to solve correctly the larger questions of naval policy. On the other hand B, in the person of the Controller, was given a seat on the Board, and was supported by a large technical staff, which was able to exert great influence on the policy pursued. Under these conditions was developed the vicious policy of building coast-defence ships, which represent the lowest depths of naval strategic thought. The fact is that the naval mind was at that time absorbed in questions connected with *matériel*. It was full of information relative to guns and armour, but with rare exceptions its ignorance of the principles of war was profound, and in consequence it had entirely misread the lessons of the American Civil War, to which may be attributed its leaning towards coast-

defence. It is a noteworthy fact supporting this view that the College opened at Greenwich in 1873 for the higher education of naval officers, provided amply for the teaching of subjects connected with *matériel*, but for twenty-seven years practically neglected the study of war—the end and aim of a military Navy.

The evil effects of the arrangement quickly made themselves apparent, and on the 19th March 1872 a new Order in Council was issued which, while maintaining the same division of the business, added another Sea Lord, and subordinated the supply of *matériel* to the conduct of war by removing the Controller from the Board, but leaving him the right to attend its sittings when designs, &c., were submitted to it. The cure was drastic, but was chiefly negative. Instead of adding not only another Sea Lord but a naval professional staff to strengthen the weaker side by providing for the study of war, the stronger party was pushed back. The reformed Board, being insufficiently supplied with information of both kinds, was probably no better fitted to deal with large questions than it was before.

This arrangement continued in force until 10th March 1882, when an opposite step was taken. Not only was the Controller replaced on the Board, but a Civil Lord with mechanical know-

ledge was added. So little was the essential work of the Admiralty Board understood, that it was supposed that the civilian would balance the naval officer. It was not seen that the working of their minds was more important than the colours of their coats, and that as both were concerned with *matériel*, the efficiency of the Board as an instrument for the conduct of war would be impaired by unduly elevating that side. After three years' experience this was recognised, and this Civil Lord disappeared from the Board.

The radical faults of the system were disclosed by the complete failure of the Admiralty in 1885, when the imminence of war with Russia found the Navy absolutely unprepared. On the eve of war no plan of action had been settled, and, strange as it may seem, some ships were actually paid off, when the proper course would have been to commission everything which carried a gun. The cause has been already explained. The attention of the Admiralty Board, during a long course of years, had been diverted from questions connected with the conduct of war to details of administration, ship construction, and supply, many of which would have been entrusted to the Navy Board and to other Boards under the old war organisation.

The want of preparation for war was so evi-

dent, and the complete absence from the Admiralty organisation of any department charged with working out the problems which war involves was so manifest, that the Foreign Intelligence Committee, which had been started in 1884, was expanded into the Intelligence Department in 1887. It was a reinforcement to A — to the side represented by the Admiralty Board of the old wars,—did something towards restoring to the Admiralty its old efficiency, and formed a nucleus round which centred the study of war.

The changes introduced under the Order in Council of 10th August 1904 now require attention.

The part of that Order which concerns us reads—

III. The First Lord shall be responsible to your Majesty and to Parliament for all the business of the Admiralty, the business to be transacted as follows :—

A. The First Sea Lord, the Second Sea Lord, and the Fourth Sea Lord to be responsible to the First Lord of the Admiralty for the administration of so much of the general business connected with your Majesty's navy, and with the movement and condition of your Majesty's fleet, and with the *personnel* of that fleet, as shall be assigned to them or each of them, from time to time, by the First Lord.

B. The Third Sea Lord and Controller to be responsible to the First Lord for the administration of so much of the business relating to the *matériel* of your Majesty's fleet as shall from time to time be assigned to him by the First Lord.

C. The Parliamentary and Financial Secretary to be responsible to the First Lord for the Finance of the Department, and for so much of the other business of the Admiralty as shall from time to time be assigned to him by the First Lord.

D. The Civil Lord and the Permanent Secretary to have such duties as shall from time to time be assigned to them by the First Lord.

The principle on which this Order in Council is drawn is not intelligible. There is no apparent reason why the divisions A and B are maintained, seeing that the three Sea Lords mentioned in A have been allotted parts of the general business besides that connected with the *personnel* and with the movement and condition of the fleet. This must mean business connected with supply. The Order sanctions the abolition of the broad division between the conduct of war and the supply of *matériel* which obtained under the system of the Admiralty and Navy Boards, under the later plan of Mr Childers, and is generally accepted as sound in all successful military administrations.

Under this Order the First Lord made the following general distribution of business :—

First Lord	General direction of business.
First Sea Lord	Organisation for war and distribution of the fleet.
Second Sea Lord	*Personnel.*
Third Sea Lord and Controller	*Matériel.*
Fourth Sea Lord	Supplies and transport.
Civil Lord	Works, buildings, and Greenwich Hospital.
Parliamentary Secretary	Finance.
Permanent Secretary	Admiralty business.

This distribution corresponds to that introduced at the War Office in the year 1904. It accords with the principle of separating the conduct of war from supply, and might prove to be successful if it were adhered to; but, as will be seen, it is being widely departed from.

The business of the First Sea Lord is more particularly defined as—

1. Preparation for war; all large questions of naval policy and maritime warfare—to advise.
2. The fighting and sea-going efficiency of the fleet, its organisation and mobilisation; the distribution and movements of all ships in commission or in the fleet reserve.
3. The control of the Intelligence, Hydrographical, and Naval Ordnance Departments.

The First Sea Lord is here made solely responsible for the fighting and sea-going efficiency of the fleet. This is an entirely new departure, which virtually makes him supreme over all his colleagues, since those words cover everything. It is a noteworthy fact that under the present War Office organisation, which is modelled on that of the Admiralty, no such responsibility is placed on the Chief of the General Staff—the counterpart of the First Sea Lord. Had that been done, that officer would have become virtually Commander-in-Chief of the Army, with full control over the supply departments, which has been proved by experience to be an unsound arrangement.

Again, the Controller's duties have been largely altered and reduced. Much of his responsibility has been transferred to the First Sea Lord. Under the Orders in Council of 1869 and 1872 he was held responsible for so much of the business as relates to the *matériel*, which was defined as that relating to the building and repairing of ships, to guns, and to naval stores. Under the new Order he is only responsible for so much of this business as shall from time to time be assigned to him by the First Lord. This is a very great and far-reaching change.

The above Distribution of Business allots to the Controller the entire administration of the dock-

yards, of the dockyard reserve, and of dockyard craft; the control of certain departments connected with the dockyards, of the *personnel* of the dockyards, and of the inspecting staff at contractors' works; also naval ordnance questions affecting construction; and other matters not necessary to mention. The construction and repair of ships, formerly included, are omitted, apparently because he can no longer be held accountable for matters which are included in the fighting and sea-going efficiency of the fleet, and thus come under the sole responsibility of the First Sea Lord. It will be seen that this change involves the transfer of work and responsibility from the Controller to the First Sea Lord, upon whom are concentrated the responsibility not only for the conduct of war, which is his proper function, but also for the most important part of the supply of *matériel.*

[1] The Committee on Designs, over which the First Sea Lord presides, now merits attention. It is an irresponsible body. Of fifteen members five hold responsible offices—viz., First Sea Lord, Controller, Director of Naval Construction, Engineer-in-Chief, and Director of Naval Ordnance: the remainder are irresponsible, being either subordinate officials or non-

[1] Written in April 1905.

officials, who, as no reports are to be published, will not have to face public criticism. It is an instance of the tendency not only to transfer the control of the *matériel* from the Controller to the First Sea Lord, but to undermine the authority and influence of the other members of the Board over the general shipbuilding policy. The broad requirements to be met by any design are still to be settled by the Board in the first instance. But every design is greatly modified during its growth by opinion, and in this case it will be influenced by that of this committee, on which largely preponderate specialists in questions connected with *matériel*, only a very small minority being unconnected with it. Broad and comprehensive views, accompanied with wide knowledge of the principles underlying the conduct of war, are inadequately represented. A committee thus constituted cannot fail to increase the tendency to view the ship as a unit, without sufficient regard to tactical and strategical requirements, which should be the dominating factors in considering any design.

Will they not be liable to attach undue importance to great size and to thick armour? To great size, although experience shows that big ships are no more free than small ones from the risks of being sunk, or of being dis-

abled in their machinery? To thick armour, although ships have been worsted without their armour being perforated? Will they realise that neither in practice nor in theory has it ever been proved that superior speed gives any tactical advantage, unless it be thought an advantage to be able to run away? And that strategically its value is discounted by its liability to fail when wanted, owing to accidents, to the necessity of saving coal, and to other causes, and by the fact that the command of the sea can only be decided by hostile fleets meeting and fighting? It is much to be feared that they will do nothing to check the diversion of money from fighting power to speed, for which the craze is as much unsupported by reason as was the adoption of the ram after the battle of Lissa. It is more likely that the latest mechanical novelty will seem to them more important than well-tried principles of war, with which the majority of the committee are probably unfamiliar.

In pursuance of the policy of obliterating the division between the conduct of war and supply, and of concentrating them in the same hand, contrary to well-established principles, the First Sea Lord presides over the Committee on Dockyard Administration, with the Controller, other departmental officers, and a superintendent of

a private yard, as members. What would be said if the Chief of the General Staff at the War Office was placed on a committee to inquire into the working of half a dozen Woolwich Arsenals? The case is parallel, and has only to be stated in this plain way to show how mistaken is the policy. The whole tendency of the recent changes, coupled with the selection of a comparatively junior officer for the post, points to a policy of unduly depressing the position and authority of the Controller of the Navy with a view to concentrating the questions connected with shipbuilding and the dockyards—the *matériel*—in the hands of the First Sea Lord, whose attention ought to be concentrated on large questions of policy.

[1] The Distribution of Business, under which the First Sea Lord is made alone responsible for the fighting and sea-going efficiency of the fleet, marks a far-reaching innovation, which greatly lowers the position and authority of the other members of the Board. To the superficial mind it may appear that his authority will be increased, but reflection will bring conviction that the very contrary will be the case, since he will have the support not of responsible colleagues

[1] Written in April 1905.

but of irresponsible men, who will be practically only heads of departments under him.

That there is a real danger of the interposition of the First Sea Lord between the First Lord and the other Lords, is confirmed by the insertion of a note to the Distribution of Business to the effect that all members of the Board will have the right to communicate direct with the First Lord. Such a note was quite unnecessary, and did not exist previous to the issue of this new Order. This alone indicates the existence of a doubt on well-established usage. The characters and standing of the men who will accept office under such conditions must deteriorate. The weight with which the First Lord will speak will be gradually lowered with the loss of prestige by his colleagues.

The authority of the Admiralty must suffer, since its success in the past has been due to the fact that in it were found united to an elastic and undefined extent the political and professional elements, which adjusted themselves to circumstances as these changed. Although administering a military service, the Lords are civil officers, and as such are on a common footing, which makes for union. Each has carried weight depending not only upon his position, but largely upon his knowledge, ability, and force of character, which have had

large scope to influence decision, while personal ambition has been held in check and subordinated to the general good by decisions being promulgated in the name of an impersonal Board. These advantages are in danger of being lost under the recent changes.

The reader may perhaps be now convinced that the weak point in naval administration, since the changes introduced by Sir James Graham, has been the diversion of Admiralty and Naval thought from questions connected with the conduct of war to questions of *matériel*. The tendency is so strong that even in the face of a distribution of business, which was apparently intended to keep the two subjects more distinct and to elevate the former, the latter is still in the ascendant, and occupies the first place in the minds of not a few. "Men's deeds are after as they have been accustomed," as Bacon most truly wrote. Men who have been employed for many years in considering questions connected with guns, armour, building and repairing ships, cannot be expected to turn their thoughts to the study of war—a widely different subject. The evil results of the faulty line of thought are very serious, as can be seen by considering recent action on the part of the Admiralty, which may be considered to be now dominated by the *matériel* school.

In the Memorandum laid before the Colonial Conference in 1902, the Admiralty set forth the great principles underlying maritime war, and dwelt especially on the necessity of concentration. In the same year, without attracting undue attention to the changes in progress, they proceeded to give effect to their views by developing the Home Fleet under a Commander-in-Chief, by forming an Armoured Cruiser Squadron, by reorganising the Destroyer Flotillas, and by rearranging the foreign stations.

[1] After an interval of two years further steps have been taken with the same object. The battleships in European waters have been rearranged, four being transferred from the Mediterranean to the Home Fleet. The Channel (now Atlantic) Fleet, for some years the detached force held available to reinforce either the Mediterranean or Home Fleet as required, has been placed under a Commander-in-Chief, and permanently based on Gibraltar. Thus the actual battleship force in the Mediterranean has been increased from twelve to sixteen battleships, and is now placed under dual control. It is evident that the admiral in command of the Atlantic Fleet is not a true Commander-in-

[1] Written in April 1905. A new distribution is to be made in March 1907.

Chief, as during both peace manœuvres and war he will act under another officer. Such an arrangement is contrary to sound strategic principles, as it makes against concentration and cuts off the Mediterranean Fleet from its Western base. The dockyard at Gibraltar is apparently the underlying cause, but would never have been accepted by a strategist as a sufficient reason.

Advantage has been taken of the completion of armoured cruisers to increase the strength of the several fleets in European waters in that description of ship, and to concentrate them in squadrons—a strategic measure which their capital importance demands. The strategic grounds for doing this were brought into notice during the peace manœuvres of 1901, and have since been confirmed by Russian and Japanese experience during the war. The present Admiralty Board do not seem to appreciate the fact that the concentration of the armoured cruisers leaves the field clear to smaller cruisers to prey on our commerce, which will be unprotected if our small ships are broken up or sold. Neither do they appear to understand the extent to which the small ship is favoured by the large chances against meeting on the trackless ocean.

This brings us to the astonishing Parliamentary returns of vessels struck off the list

of effective ships of war, dated 6th and 22nd March 1905, which include the names of 155 ships. The returns are very misleading, as they are swelled by the names not only of hulks long since condemned, but also of ships entirely efficient. The issue has been confused, either through want of clear thinking or of set purpose, by introducing such meaningless terms as "ships of comparatively small fighting value" and "ships available for subsidiary purposes of war." The magnitude of the blunder committed will be understood when it is realised that two Japanese cruisers—the *Naniwa* and *Takachiho*—of about 3600 tons, launched in 1885, completed the defeat of the Russian cruiser *Rurik* of 11,000 tons, launched in 1892, and that several Japanese small ships more than fifteen years old did most useful work during the war. In the face of this war experience, four cruisers of the *Australia* class of 5600 tons, completed in 1888-89, and repaired during the last six years at a cost of £200,000, besides ten cruisers of the *Tribune* class of 3600 tons, completed in 1891-92, have been classed as of comparatively small fighting value! Among other ships sold on the 4th April, many of which are as effective as, or more so than, those used by the Japanese, two ships of the *Australia* class may be mentioned.

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Each cost originally about £266,000, and sold for only £10,000.

The present unreasoned craze to hastily condemn ships as obsolete is quite contrary to war experience. The ancient *Naniwa* did better service than the modern *Askold* or *Novik*. It is evident that the nature and amount of the work which war involves is but little understood. Under cover of the battle-fleets an immense amount of work has to be done, not only in attending on the fleet itself, but in connection with any military expedition which may be undertaken. This can be best intrusted to small ships of no great power. Many ships will also be required to cover the trade from the attack to which it will be exposed from the small cruisers of the enemy—the most dangerous form of attack. In fact, the work will be so multifarious that place will always be found for every ship which carries a gun. Sufficient has, perhaps, been said to convince the reader that many ships are being prematurely condemned. This is undoubtedly due to neglect of the study of war, and to attaching too much importance to the *matériel*. It is forgotten that the spirit of the men in the ships is more important than the ships themselves. The most serious feature of the policy of prematurely condemning ships initiated by the present Board is

the spirit which is inculcated. It is not the spirit which led the famous Lord Cochrane in an obsolete brig to capture a Spanish frigate; it is not the spirit shown by von Tegetthof, who, when told that the ships were not up-to-date, replied, "Only send them! Send them as they are; I'll find some use for them!" And, emphatically, it is not the traditional spirit of the British navy, which has hitherto always been ready to hoist the pendant on anything that floats, rather than be left behind.

Note.—Although several administrative changes have been made since this article was written, it has been left practically unaltered, because time has tended to confirm the truth of the views expressed.

II.

EDUCATION.[1]

To the superficial mind no two things can appear more unlike than the sailing-ship of the line and the armoured battleship. They differ widely in all that appeals to the eye—in general appearance, in structure, in motive power, and in the material of which they are built. But to the thoughtful seaman, who regards both the wooden sailing-ship and the steel steam-ship as an instrument of war, these are differences of detail. In his view they are alike in the fundamental fact that each is a floating gun-carriage, and that each is not only a ship but a machine, differing in kind, it may be, but still a machine, —the sailing-ship equally with the steamer. The modern war-vessel is as much a ship as was the wooden two-decker, and the *Victory* was as much a machine as is the modern *Edward VII.* From the point of view of their care, maintenance, and management, the difference between the old

[1] Blackwood's Magazine, October 1905.

machine and the new one lies in the source whence the motive power is derived, and in the mechanism by means of which that power communicates motion to the ship. The wind has yielded to steam as the motive power. The mechanism has changed from the masts, yards, rigging, and sails of the past to the engines and propellers of the present; it is of a different kind but is equally complicated. The network of ropes and blocks aloft has been replaced by the labyrinth of pipes and valves below, but no great difference exists in the extent and scope of the knowledge required to deal with these two widely unlike mechanisms. Each requires to be kept in order. The marling-spike may have made way for the file; knotting and splicing may have given place to making joints and packing glands; but the time, the care, the attention required to keep the machines efficient are the same whether they are sails or engines. Again, each has to be worked. Reefing topsails in a gale of wind on a dark night may seem a very different operation from driving an engine, but the skill and knowledge required are not unequal in degree, although they are totally different in kind, and can only be acquired at the expense of an equal amount of time, care, and attention. Whether with sails or with steam, the skill and knowledge needed

are mainly of a practical order, and can only be acquired by actual contact and use. The best and most competent seamen and engineers have supplemented their practical experience by an exact knowledge of principles, but the great majority of steamers as of sailing-ships have been worked efficiently by men with little beyond practical experience. It is not to be expected that the ordinary practice will ever be otherwise.

If the resemblance in aim or intention between the mechanisms of the sailing-ship and of the steamer is fundamentally so close, the knowledge of its working possessed by the officers of the sailing navy may indicate in amount and extent the needs of the officers of the steam navy in this direction. The naval officers of the past were satisfied to possess a sufficient knowledge of the ship, her armament and equipment, to ensure using her to the best advantage. They concerned themselves with her working and management rather than with her construction. They did not pretend to be proficient in knotting and splicing or in sail-making, but their knowledge was sufficient to enable them to supervise the work, and to see that it was properly done by the boatswain and the able seamen whose business it was. It is true that a few individual officers were skilful in these

matters, but they were exceptions, and such of these as were in the front rank were not held to be so for that reason. Precisely the same amount of knowledge is necessary to naval officers now, if they are to use the modern ship to the best advantage. They require to concern themselves with the working and management of every part of her rather than with construction and design. It is no more their business now to be skilled mechanics and to rival the engine-room artificers, than it was in the past to emulate the boatswain and the able seamen, who were the skilled mechanics of the sailing navy. Their business is a higher one. Their *raison d'être* is war.

The ship of war is something more than an ordinary ship. She is primarily an instrument of war, and as such is a means to an end. The arrangements for moving her are important, but less so than the way in which she is used. The working of the sails, or of the machinery, is entirely secondary to questions which govern the fighting—to tactics, to strategy, to the discipline and spirit of the crews, and, in fact, to all that is embraced under the general term, "conduct of war." In these fundamental matters the change in the motive power has not introduced any alteration in principles. To a complete practical knowledge of their ships, and of every-

thing in them, officers must therefore add a wide and thorough knowledge of war.

The foregoing arguments, if true, seem to indicate that the system of training which produced the Hawkes, Ansons, Rodneys, St Vincents, and Nelsons of the past, may be a safe guide for the future. That system was based on the idea that he who goes down to the sea in ships should become early accustomed to a sea life, and should possess a practical working knowledge of a ship and everything she contains.

The general importance of custom has never been more forcibly put than by Francis Bacon in the following passages from his essay on "Custom and Education":—

"Men's thoughts are much according to their inclination; their discourse and speeches according to their learning and infused opinions; but their deeds are after as they have been accustomed. And therefore, as Machiavelli well noteth, there is no trusting to the force of nature nor to the bravery of words, except it be corroborate by custom."

After giving instances of the predominancy and tyranny of custom, he proceeds:—

"Therefore, since custom is the principal magistrate of man's life, let men by all means endeavour to obtain good customs. Certainly custom is most perfect when it beginneth in young years; this we call education, which is in effect but an early custom. So we see,

in languages the tongue is more pliant in all expressions and sounds, the joints are more supple to all feats of activity and motions in youth than afterwards.'

Who can doubt the truth of these words? The irksome nature of a sea life to the majority of those who embark late is a notorious and well-known fact. Nothing is more pronounced and continuous on the part of such officers than their anxiety to get shore appointments. The difference is very marked between English officers, who go to sea early, and those of other nationalities, who do not. Not long since an international squadron was assembled in certain waters for several months. Foreign observers remarked of it that the British officers appeared to be happy and contented, whereas the others were quite the reverse, and were longing to get home. The remark was just. The reason is believed to have been that the majority of the former had become accustomed to a sea life at an early age.

It may be said that steamers are not as long at sea as were sailing-ships, and that the discomforts of a modern sea life are not great. The experience of the Japanese navy during the present war has proved that steam fleets in time of war pass quite as much time at sea as did the sailing fleets. It is believed that the crews of certain ships did not set foot on

shore for months. Ships may be somewhat less uncomfortable now than they were in the past, but life on land is now more luxurious, so that the differences between life afloat and ashore are unchanged. It is this that tells—the restraint, confinement, and ceaseless responsibility especially—rather than the absolute amount of discomfort.

Another well-known and important advantage of going to sea young is that boys acquire quickly the habit of command and a knowledge of men and things, coupled with a quickness of eye and a readiness of resource which do not come so easily later in life. This argument only holds in the case of those who are allowed to take their proper share in the duties of the ship, as was the practice in the past. Unfortunately there arose a custom of abandoning this practical training in favour of mere book knowledge. This was brought about largely by the pressure of men who, having little or no sea experience, were unable to appreciate the value of practical training. These argued that naval officers were not taught to think under the old system. It was forgotten that they were trained to observe, and acquired habits of order and a knowledge of men and things which were really an education in themselves. It is noteworthy that by such a competent ob-

server as Professor Main of the Portsmouth College — himself a Senior Wrangler — the men produced in the past were considered to have an extraordinary capacity for hard mental work, when a distinct object was to be gained.

It will be interesting and useful to trace the gradual change in naval education which has taken place during the last century. At the close of the French war in 1815 cadets were entered between the ages of 12½ and 14. Some were sent straight to sea, others to the college at Portsmouth, where they underwent a course of instruction for two years. Between the two classes existed much antagonism, doubtless due to the diverging lines of thought produced by difference of training, and not allayed by the advantages accruing to the successful "Collegians." These advantages varied from time to time. At one period the cadet who passed out first was awarded a gold medal, which carried with it a lieutenant's commission on passing in seamanship at the age of nineteen. This was found to be too great a prize to be won at the age of fourteen or fifteen, and was abolished. In 1835 the maximum reward to the most successful cadet was a silver medal and one year's time. After serving six years at sea, including any sea time allowed for meritorious pass-

ing out of the college, and being nineteen years of age, they were examined *vivâ voce* to ascertain whether their practical knowledge was sufficient to qualify them for the charge of a ship at sea. No other qualifications were required. Beyond the above two years at the Portsmouth College—which was abolished in 1837—and the desultory instruction given by naval instructors to the limited number of midshipmen borne in large ships, no further educational facilities were given. The officers produced were good practical seamen, and the so-called "Collegians" possessed a grounding in mathematics, navigation, and cognate subjects; but the majority lacked the knowledge of the higher branches of their profession, including war, which their predecessors had acquired during the long struggles of the eighteenth century. War and its requirements dropped more and more out of sight during the long peace. The leading men were left to educate themselves, and sometimes did so. The Admiralty gave them no assistance or encouragement until 1839, when men began to have a glimmering of the necessity for a higher education. The Portsmouth College was then reopened, not for cadets but for a certain number of officers and mates who were to be instructed for one year. The education given was narrow, and was limited chiefly to

mathematics, navigation, astronomy, steam, and fortification. War was not studied, and the importance of naval history was quite unappreciated.

To the men thus trained fell the Crimean War, and the changes from sail to steam, from smooth-bores to rifled guns, from wooden ships of the line to armoured battleships. If war had been studied, and higher education of the right kind properly encouraged, during the period 1839-59, the reader is asked to reflect on the difference in progress which might have resulted during the eventful period 1859-85,—between 1859, when the *Warrior*, the first ironclad, was laid down, and 1885, when the imminence of war with Russia exposed the backward state of the navy and initiated the naval renaissance. Quite twenty years are required to give full effect to radical changes in an educational system. Would minds trained to deal with the fundamental principles of war have clung to sails quite so long? or misreading the lessons of the American Civil War, have sanctioned the building of ships fit only for coast defence? or have failed to acquire a thorough knowledge of the new motive power? or have depreciated the efforts of the late Admiral Colomb to direct naval thought to the study of tactics and strategy? It is a noteworthy fact that the neglect to study war

systematically continued until the year 1900, when the Board of Admiralty directed a war course to be started at Greenwich College. It is true that the Order of January 1873 establishing the College for the higher education of naval officers contained this clause:—

10. Naval history and tactics, including naval signals and steam evolutions.

But so little attention was paid to this that it was not included in the Regulations dated November 1888. The navy was too much occupied with questions connected with the *matériel* to trouble about such matters as strategy and tactics! May this not have been due to the influence of the "Collegians," whose mathematical training would fit them to deal with questions connected with ships and their fittings, but would neither help them much in the study of war nor turn their thoughts in that direction? The late Sir Cooper Key, the most distinguished "Collegian," was the first President of the Greenwich College, and, as has been shown by the late Admiral Colomb, never fully understood the fundamentals of naval strategy. This must have been due in some degree to his education, as his ability and capacity were undoubted. It is significant that he was First Sea Lord in 1885, and had been so since 1879. May it be that the

Navy's distrust of the "Collegians" was to some extent well founded, in that the higher education which they favoured was not of the right kind?

The Crimean War reacted powerfully on the naval mind, and paved the way for many innovations—steam, armour, and the rifled gun—and for educational reform. The system of entry and education, which had enjoyed a struggling existence from the year 1729 until its abolition in 1837, was again introduced in 1857. But instead of the Portsmouth College, a harbour training-ship — eventually the *Britannia* — was used. The age on entry remained practically the same from 1815 until 1898, when a material increase was made. The facts are as follows:—

Year.	Age on entry.	Time at College or in *Britannia*.	Age on going to sea.
1815	$12\frac{1}{2}$ to 14	2 years	$14\frac{1}{2}$ to 16
1859	12 " 14	1 year	13 " 15
1869	12 " 13	2 years	14 " 15
1873	12 " $13\frac{1}{2}$	do.	14 " $15\frac{1}{2}$
1887	13 " $14\frac{1}{2}$	do.	15 " $16\frac{1}{2}$
1898	$14\frac{1}{2}$ " $15\frac{1}{2}$	$1\frac{4}{12}$ years	$15\frac{10}{12}$ " $16\frac{10}{12}$

It may be noted that during the eighteenth century the age on going to sea varied between ten and seventeen, those who did not join the Academy embarking generally younger than those who did. Keppel was ten; Rodney, Hawke, and Nelson, twelve; Jervis, thirteen; Duncan and Keith, fifteen; Dundonald, seventeen. Not one of these appear to have passed

through the Portsmouth Academy, with its two years' course of instruction.

Up to the time of actually going to sea no great difference existed between the College system of 1815 and the *Britannia* course of 1898. It is true that in 1868 a sea-going training-ship was introduced, in which the cadets passed one year; but this was abolished in 1873, as it was rightly held that the fleet itself, with all its varied experience, must necessarily give a professional training far better and more real than could be obtained amid the artificial surroundings of a special training-ship. In 1902 the *Britannia* was found to be too small for the increased number of cadets. Regardless of past experience, a sea-going training-ship was started to provide the necessary accommodation. The professional training of the boys would have gained by drafting them direct into the fleet, but a special training-ship was more favourable to producing officers of the same pattern and to the passing of examinations. What would the modern Navy be without superficial examinations ! ! !

It is in the education after leaving the training-ship that the great and vital change was made. For a practical training unsurpassed was gradually substituted a very inferior book education. A Chinese system of examinations was

the engine by means of which this was brought about.

The original examination in seamanship for the rank of lieutenant was a *vivâ voce* "pass" to ascertain whether the candidate was competent to take charge of a ship at sea, and was conducted by three captains or commanders, as being most interested in seeing that the officers under them were efficient. This was supplemented by "pass" examinations, in gunnery on board the *Excellent*, in navigation and steam at the Portsmouth College. During the 'Sixties accelerated promotion was given to those who took first-class certificates in the three subjects. The examinations thus became competitive instead of simply for a "pass." The advantages derived from early promotion were so great that this change soon began to make itself felt, and was wide-reaching in its results. Although candidates only went to the *Excellent* and College to pass, they were allowed time in each case to prepare for examination. Under the pressure of competition, demands were first made to equalise these times for all, and then to extend them with a view to education instead of merely to preparation. When the Greenwich College was opened this was done. Commencing 1st January 1874, the gunnery course in the *Excellent* was fixed at three months, and that

for navigation at the College at six months. Subsequently were added a pilotage course, and in 1882 a torpedo course in the *Vernon*. By 1886 the system had been entirely changed, and was then as follows: Cadets entered at ages between twelve and thirteen and a half, passed two years in the *Britannia*, went to sea between fourteen and fifteen and a half, served at sea five years less the time allowed out of the *Britannia* — one year being the maximum,— passed in seamanship and joined the College between nineteen and twenty and a half. They now passed through the following courses of instruction: at Greenwich, for navigation and mathematics, six months; in *Vernon*, for torpedo, one month; in *Excellent*, for gunnery, three months; at Portsmouth, for pilotage, two months. This consumed, including leave and interruptions of various kinds, about fifteen months. The age on completing the whole varied between $20\frac{3}{12}$ and $21\frac{9}{12}$ years.

Those who passed the best examinations were immediately promoted, and gained upwards of two years over their contemporaries. As in the case of the gold medal of the Portsmouth College with its lieutenant's commission, this was considered so excessive that an attempt was made to mitigate it. In 1891 was introduced a graduated scale, based on the classes of certificates

obtained. This scale made accelerated promotion applicable not only to those who took all first-class certificates, but to others who passed less well. The competition was extended by this to a much larger number of officers, instead of limiting it to those in the first flight. At the same time, it was recognised to be futile to attempt to pass the whole body of sub-lieutenants through the same mathematical course, thus confirming the opinion given by Professor Main twenty years before. The Greenwich course was divided into two parts of three months each, the first only being compulsory. This was the first sign of a reaction against the system.

The effect of these examinations on the naval service has been profound. The professional career of the present generation has been governed by ability to pass examinations rather than by their practical professional knowledge. So much has depended upon the result of the examinations that practical training at sea has been sacrificed to prepare for them. The qualifying sea service has been reduced. This was six years during the sailing era, five years and six months in 1859, and only three years and six months in 1900, including *Britannia* time in each case, which might be twelve months as a maximum in 1859 and four months in 1900. Midshipmen have been so largely

withdrawn from the ordinary duties of their ships for the purpose of attending school, that they have not had sufficient opportunity to acquire practical knowledge of the working and management of ships, their fittings, equipment, and armament. Unlike their predecessors, they have not made themselves familiar with the practical working of the motive mechanism. They have become lieutenants, notwithstanding that they undoubtedly possessed less knowledge of these matters than their predecessors. This has been recognised in so far that, whereas formerly when a midshipman passed in seamanship for the rank of lieutenant he was held to be qualified to take charge of a ship, such is now not the case. He must now, after passing all his examinations, serve six months at sea, and obtain a certificate from his captain that he is fit to perform efficiently the duties of a lieutenant. What a commentary on the examinations!

The effect of a system of education based on superficial courses and examinations has been to give an advantage to minds of a superficial type, and to discourage men who aim at deep and solid acquirements. Professor Main foresaw this in 1870, and said: "In my opinion, in the higher branches of the service we have more educated, thoughtful, and intelligent men than we shall have among those who are coming

on now. I think their schoolboy education on board ship militates against their naval duties and *vice versâ*." The reader is invited to consider whether the recent somewhat sensational policy, with its superficial explanatory memoranda, is not the natural outcome of a shallow and superficial educational system.

It is difficult to understand how men have come to be satisfied with such a state of things. They must have been blinded by the change from sail to steam. Misled by the much misused word "science," they have come to think that exact knowledge is a plant of modern growth, and can only be derived from books,—that practical acquaintance with the thing itself is secondary to a theoretical knowledge of it. They have forgotten that the officers and men of the past had an exact and complete knowledge of their art, and that this was obtained almost entirely from practical experience afloat, and not from courses of instruction on shore. The system now in force in the Navy is the very contrary of that which prevailed in the past. All along the line instruction on shore has been substituted for actual practice and experience at sea. The instruction in gunnery, torpedo, signals, and navigation is centred in harbour or shore establishments. It is now a fundamental principle in naval training that no officer or man can be

"hall-marked" in any of these matters on board a sea-going ship. He must obtain a certificate from a shore establishment. To such a pass have matters come that a gun-layer, or man who lays and fires a gun, cannot be made afloat: he must leave the battleship, where every facility exists for training him, and every one, from the captain downwards, is directly interested that he should shoot well and be thoroughly competent; he must go to a school on shore, where only artificial arrangements exist for teaching him, and no one has any direct interest in his efficiency. Gunnery has been referred to more particularly, but the argument is equally applicable to other branches. The tendency of all such schools is towards formalism. At such establishments, surrounded with "make-believe," a great deal of perfectly useless matter will inevitably be taught. These schools are good servants but bad masters. They should be made strictly subservient to the sea service. Instead of that they have become its masters, with the result that they have seriously impaired efficiency by setting up false standards. Their evil influences are twofold. All questions from the fleet are referred to them. Human nature being what it is, and much dependent upon its surroundings, their influence is always directed to keeping the control of the training in their own hands,

and to discouraging initiative in sea-going ships. As a result, large numbers of officers and men are locked up in harbour ships and shore establishments at the three Home ports, instead of being placed on board commissioned ships in reserve, where they could not only help to keep the ships in order, but be themselves trained more effectively. Not the least serious result of the system is that large sums of money are expended in making provision for the shore training. Colleges and barracks are unduly multiplied, while the fighting efficiency of the fleet is not increased.

We are now, perhaps, in a position to affirm that, whether ships of war be propelled by wind or by steam, the essential qualifications of those who have to manage them are the same. The lessons from the past seem to indicate that naval officers should be given the best general education possible before being sent to sea; that they should become early accustomed to a sea life; that they should possess a practical working knowledge of their ships and of everything they contain; and that the leading men should have not only a complete knowledge of the "conduct of war" but a wide and thorough grasp of the principles underlying any particular *spécialité* which they adopt.

These requisites involve going to sea at an age not later than fifteen years and six months, and a minimum qualifying sea service for the rank of lieutenant of five years. A practical working knowledge of the ship and of her equipment can only be obtained by devoting the whole time at sea to the practical duties of the profession. Its soundness can only be assured by placing all the examinations in the hands, not of gentlemen on land, but of the officers in the fleet, who, being in touch with realities, are the best judges of what is necessary. The examinations should be only for a "pass," to ascertain whether the candidate is competent to perform the duties of a lieutenant, which involves practical ability to work the ship, her armament and machinery. They should not be competitive, because it is not possible to ensure equal opportunity without sacrificing efficiency.

The gunnery, torpedo, and pilotage courses on shore should be abolished, the time now devoted to them being much more usefully employed afloat, where these matters can be taught more practically. Those who pass successfully through such a training should be practically familiar with their duties and fitted for the ordinary work of the Navy. Such a practical training is not in itself sufficient. A higher education is necessary to enlarge the mind, to train the

thinking powers, and to inculcate a knowledge of principles. This higher education should be entirely voluntary, and might commence at any time after completing six years' service in a ship of war at sea. It should be open to all who intend serious work irrespective of their ability. The time allotted might be one year, extended to two years for selected men and reduced for those who make unsatisfactory progress. The curricula should be framed on the broadest lines. The particular course of study to be followed by any individual should be left largely to his personal inclination, but would be regulated to some extent by the particular line he wished to adopt. The incentive to work would be the appointments for navigating, gunnery, torpedo, staff of flag officers, and engineering. The examinations should be competitive in so far that they should involve "passes" to reach different standards of efficiency, carrying with them different rates of extra pay.

Officers should be encouraged to return later to the College to study war, or to follow further any particular course of study in which they are interested or proficient. Such officers should not be subject to any compulsory examination.

The examination for the rank of commander, recently ordered, is a pernicious innovation, and should be cancelled. It can only foster a super-

ficial knowledge of international law, strategy, and tactics, than which nothing can be more dangerous and useless. Such subjects are to be pondered over and studied during the whole professional career of an officer, and not hastily taken up for a few weeks to pass an examination. Such studies can be most effectively encouraged by giving officers the most favourable opportunities for prosecuting them, and by employing those who show special aptitude in those lines to work out the numerous questions involved. The promotion of an officer to the rank of commander should depend alone on his professional character and attainments as shown by his daily work—a much more severe test than any examination.

The foregoing proposals are based on the idea of reverting to the well-tried system of the past, improved by additions and modifications to meet modern conditions. Comparing them with the new system of entry and training initiated in December 1902, certain differences will be found. The age for entry is now between twelve years and eight months and thirteen years, and the time under instruction at Osborne and Dartmouth is four years. Thus the age on going to sea will vary between sixteen years and eight months and seventeen years. This is considered to be too late.

In the course at Osborne College special stress is laid upon the fact that the cadets receive instruction and do manual work in the "shops" attached to the school. It is claimed, and has been generally accepted by the public, that this is giving these boys training in the practical work of their profession. It may be useful to consider to what extent this manual training is necessary for those who will have to manage machinery.

An extended course of manual work, no doubt, usually forms part of the marine engineer's training. The reason why so much stress has been laid on this is not far to seek. In the early days of marine engineering steam machinery in general was comparatively rare. So rare was it, that a regular profession or calling of what we now term "engineer" was unknown. Many people still living can remember when naval engineers, who had had some experience of steam machinery before going to sea, spoke of themselves as "millwrights," that being the only term applied to those who as yet hardly formed a distinct speciality. The millwright made the "mill" or machine, which he afterwards drove. It soon came to be regarded as a matter of course, that no one could drive an engine unless he had had some share in the manual work of making one. The belief solidi-

fied, and when the management of marine steam machinery had become a thoroughly distinct profession, it still continued to be believed that the manual work above alluded to was the first essential. To this must be attributed the repeated vacillations in fixing a course of training for naval engineers. It was seen that making parts of an engine—which the necessity of subdividing work owing to variety of parts alone permitted to any individual—was a very insufficient training for managing machinery on a large scale. At the same time, a sound conviction prevailed that the training of the marine engineer must be practical; and the only way of making it "practical" that was thought of was to oblige the intending engineer, at odd times and in the intervals between other courses of instruction, to do the work of a "fitter."

The marine engineer's profession has long reached a stage at which the above idea of what is "practical" is quite out of date. It is no doubt necessary that he should have a certain familiarity with the use of tools, but to keep him doing now and again small jobs of manual work is to lag quite behind the age. It is no more necessary for him to become an expert mechanic than it is for the architect to become an expert bricklayer, or for the civil engineer, who directs the construction of an

embankment or of a bridge, to become a navvy or expert rivetter, or than it was for the naval officer of the past to be a skilled rigger or sailmaker. What the marine engineer requires in the way of "practical" instruction is frequent and long-continued experience in the actual work of driving and running marine engines, and in the care, maintenance, and management of engines and boilers. With the actual manual work of repairing the machinery in his charge he has no more to do than a civil engineer has with the manual work of repairing the bridges which are under his supervision. It will be quite by accident if there is a single engineer in the Navy who would be capable of repairing with his own hands a ship's damaged engines. If there are any engineers who can, it will be because they happen to be specially interested in work of the kind. If the question is looked fairly in the face, it will be found that the training of the engineer is as different from that of the engine-room artificer as was the training of the lieutenant of the sailing era from that of the boatswain.

This point has been argued at length because it is fundamental. It is held that the new scheme of training errs in placing too much stress on the workshop training and too little on sea-going practice. Three years' sea service was not sufficient to produce a reliable lieutenant in the

sailing era, neither is it now. At least five years are necessary to teach the average officer his practical work in a modern steam-ship. In no less time can he learn to handle the machinery, the guns, the torpedoes, the electric lights, as well as his predecessors managed the sails and guns of the past.

Not only does the new scheme as sketched in the Admiralty memorandum of December 1902 provide for only three years' sea service as midshipman, but it perpetuates the system of examinations and shore courses. The circumstances under which this pernicious system was developed deserve particular notice. It was introduced just at the time when the motive power was changing. It grew with the disappearance of sails, because the time formerly devoted to learning how to handle them was appropriated to books instead of being given to acquiring a practical knowledge of the steam-engine. The decadence of practical knowledge of their ships among junior officers was not noticed. It is true that a generation since a sagacious minority tried to stem the tide. These saw that a practical knowledge of the motive mechanism, whether it be sails or engines, was essential to the naval officer. They set the example, and learned practically to manage machinery as they had before learnt to handle sails. But all was of no avail. They were beaten by the "Collegians," who were in com-

plete control of the education of the Navy, and were as much against the rising generation acquiring a practical knowledge of the steam-engine as they were against the study of war. The seed that was sown in 1839 by giving a wrong direction to the higher education at the Portsmouth College was harvested at the Greenwich College in 1873, and has since been reaped annually. In 1902 a great opportunity presented itself, but was missed. The control was still in the hands of the same school. They failed to recognise that a thorough practical training at sea is of the first importance, and that on it should be superposed a higher education. They did not understand that this higher education should be based on the idea that, as a subject of study for the naval officer, war is more important than the ship herself. Still imbued with a sense of the importance of the *matériel*, and believing that instruction is inseparable from ships and dockyards, they removed the "war course" from the Greenwich College to the three Home ports. They did not realise that the study of war requires concentrated attention, and is not to be prosecuted with success by men whose thoughts are continually diverted to the care of their ships. They have found out their mistake and have concentrated at Portsmouth, where they are now falling into another error. Instead of confining the course to the close study of war — to thinking, which is

hard and difficult—attention is being diverted to the more easy and therefore more congenial task of toying with cruisers and destroyers. They forget that the fleet itself, and not a "make-believe," is the true instrument with which to make experiments. The "war course" should return to Greenwich, whence it should never have been moved.

Changes in the Navy are necessary; but if they are to be real reforms, they must be of the right kind and properly directed. It is of the greatest importance to distinguish a reform from a mere innovation or change. The distinction can only be determined by correct thinking. Until there be correct thought there cannot be right action, and when there is correct thought right action will follow. Up to the present great confusion of thought has been manifest in the minds directing naval reform. The action of the Admiralty and the various official memoranda presented to Parliament—more especially that on the entry and training of officers dated 16th December 1902—are proofs of the correctness of this assertion. Take, for instance, the following statement: "In the old days it sufficed if a naval officer were a seaman. Now he must be a seaman, a gunner, a soldier, an engineer, and a man of science as well." A more erroneous idea has been rarely conveyed in two sentences. Was

Drake only a seaman? He was one of the greatest warriors of the age, and the trusted councillor of his sovereign. Were Anson, Hawke, and St Vincent only seamen? They were members of the Cabinet, and trusted by the nation. Nothing is more certain than that the great admirals have always been much more than mere seamen. It is astonishing and regrettable that a memorandum issued from the Admiralty should imply otherwise. Again, since the days of the Armada, has not the gun been the principal weapon, and has not the knowledge of its use been always of primary importance? Could any modern captain give more attention to the gunnery efficiency of his crew than did Broke of the *Shannon?* It is difficult to understand why a naval officer should be more of a soldier now than were Drake and Nelson in the past. War has not changed. As to his being an engineer, our whole argument has tended to show that the modern officer should have as intimate knowledge of his ship as had his predecessor. If he controls and manages the motive mechanism, he will do no more than did the seamen of the Elizabethan age and their successors of the Nelsonian era. We hold that the division between the military and engineer branches in the sea-going navy is a source of weakness, and should gradually cease.

III.

THE OFFICER—PAST AND FUTURE.[1]

THE management of a ship-of-war calls for three separate sorts of knowledge to meet the conditions of—

1. Fighting.
2. Navigating and manœuvring.
3. Working the motive mechanism—*i.e.*, the sails of the sailing-ship or the engines of the steamer.

The first may be called the military side of the naval officer's calling, as distinguished from the nautical, which includes the last two. It may seem strange to couple the sails with the engines, and to include the latter on the nautical side; but if each is viewed simply as the motive mechanism, it will be evident that its working is as much a nautical business in the one case as in the other. Our argument requires that

[1] Blackwood's Magazine, December 1905.

care should be taken to distinguish between the two kinds of nautical skill.

The struggle between the military and nautical sides—between the conduct of war and seamanship—has always existed, and in the nature of things must ever continue. During peace, war is usually forgotten, and seamanship assumes undue importance. In time of war, the two are seen in their true proportions. The conduct of war then becomes predominant, and seamanship is found to be only a necessary and important handmaid, of which men learn to take what is essential. The two sides have sometimes been represented by separate classes of officers and men, at other times they have been merged in one. The particular system, or organisation, in use at any given time seems to have been the result of the influence, in varying degree, of the weapons in use, of the nature and efficiency of the motive power, of the social, political, and military conditions.

During the feudal age, the sword, the spear, and the bow were the chief weapons used in battles by land and sea. The knights, men-at-arms, and archers were the deciding factors in war, and exercised a predominant influence. They formed the fighting portion of the crews of ships and practically controlled their movements, although the sea officers and men actually

handled and worked them. The supremacy of the military over the nautical element was complete, and reflected the conditions of a society organised on a military basis. The small estimation, in which the sea officers were held, is indicated by the wages of the master, the highest in rank. He received only 6d. a-day, the same wages as an archer, whereas a simple esquire received 1s., a knight 2s., and an admiral 4s. if a knight, 6s. 8d. if a baron, and 13s. 4d. if an earl. The relative functions of the two classes are indicated by two facts rescued from the records of the past. Commanders of squadrons were styled "captains and leaders of men-at-arms and archers on the sea," or something to the same effect. The admiral's ship carried a light at her masthead, "so that all the masters of the fleet may know and understand the course of the admiral, the which course they shall keep." Clearly the master was held responsible for the navigation of the ship, while the fighting men were considered more important than the ships. In fact, the ships appear to have been looked upon not as instruments of war, but as little more than transports or a means of moving the army to the scene of its proposed operations.

The feudal age culminated during the fourteenth century in the reign of Edward III.,

who, attended by the great feudal lords, commanded in person at the great sea-fights of Sluys in the year 1340, and Espagnols-sur-Mer in 1350. The bulk of the English fleet at that time were sailing-ships, usually with one mast; but the smaller ones used oars as an auxiliary under special circumstances, such as calms and light winds. They never exceeded 300 tons in burthen, and were manned by about three men to every five tons of burthen, besides men-at-arms and archers, who usually numbered one half the sea officers and men. Thus the crew of the cog *Thomas*, which was probably of 200 to 250 tons burthen, numbered one hundred and thirty-seven, besides soldiers and archers, probably sixty to seventy in number. A barge from Hull carried sixty-seven seamen, besides thirty soldiers and archers.

The interval between the death of Edward III., in the year 1377, and the accession of Henry VIII. in 1509—a period of one hundred and thirty-two years—saw the gradual break-down of the feudal system. The increasing use of artillery, the development of fire-arms, and the increased efficiency of the foot-soldier, gradually undermined, and finally destroyed, the supremacy of the feudal cavalry on land. The knights and men-at-arms lost their importance and influence. On the other hand, the dis-

covery of America and of the passage round the Cape enhanced the estimation in which the seaman was held. When warlike expeditions were limited to short raids across the Channel, or perhaps as far as the shores of the Bay of Biscay, his *rôle* was limited; but with the longer voyages, and the growing practice of keeping the sea, seamanship assumed greater importance. Ships had much increased in size during the period. The *Sovereign*, rebuilt in the year 1509, measured 600 tons. The navy of Henry VIII., according to Mr Oppenheim, included several vessels of equal or greater tonnage, the largest being of 1000 tons burthen. The motive power had not changed, but the sailing qualities had improved. All ships, except the smallest, carried four masts. The weapon had changed. Ships were armed with a large number of cannon, although bows and arrows were still carried. The *Sovereign* carried 85 guns, varying from curtals weighing 3000 lb. to small swivels. The larger size and increased seaworthiness of the ships, combined with their armament of guns, had converted them from mere transports into instruments of war. The management of the ships had become of equal or even greater importance than the command of the men. The change in the weapons from the sword,

spear, and bow to the gun was favourable to the seaman, since the use of the latter on board ship was peculiar to the sea, whereas the former could be used indifferently ashore or afloat.

Notwithstanding the evolution in the ship, in the weapon, and in the social and military conditions, but little change appears to have been made in the *personnel* up to the reign of Henry VIII. The proportion of soldiers in the crew had indeed increased from one-third to more than one-half. Thus, in an indenture made with the King by Sir Edward Howard, the Admiral in command of the Fleet in the year 1512, it was set forth that the latter should have under him 3000 men, of whom "18 shall be captains, 1750 shall be soldiers, and 1223 shall be mariners and gunners." The inclusion of the gunners with the seamen is significant. Again, in 1513, the crew of the *Sovereign* included 400 soldiers, 260 sailors, and 40 gunners. It must be remembered that the soldiers were neither the ancient feudal retainers, who had disappeared, nor were they the regulars of a standing army, which had as yet no existence. It was the day rather of the militiaman, whose officers were neither knights nor trained soldiers. Sea experience was still centred in the master, but the

control or command of the ship passed imperceptibly from the feudal knight to the military officer, to the courtier—from the man with military knowledge, but without nautical training, to him who possessed neither. The opening years of the sixteenth century not only found the Navy ripe for a change, but the military and political condition of Europe facilitated it. These conditions were singularly parallel to those of our own day, in that after the collapse of the feudal system Continental armies had been organised on a new basis and had become formidable and veteran forces, while that of England remained still little more than a militia, without any proper organisation. Thus the fighting force on which Henry VIII. came to rely was the Navy. This he developed and organised, keeping many ships in commission at sea. This increased the sea experience of the officers and men. The officers in command became experienced seamen. Those who had previously contented themselves with commanding the soldiers and fighting the ship assumed control of the motive mechanism. This naturally resulted from their knowledge, which always gives control sooner or later when work has to be done. The constant sea service due to the voyages of discovery, to the semi-piratical

and privateering expeditions so common during the sixteenth century, and later, in the reign of Elizabeth, to the half-veiled war with Spain in distant waters, produced a band of men possessing the same skill in war at sea as their ancestors of the same class had shown on land at Crécy and Agincourt. In them the military and nautical sides of the naval officer's calling were first combined in the same men. The most illustrious exemplar was Drake, who was not only a seaman skilled in navigating and manœuvring the ship and in working her motive mechanism, but a great military commander, which means that he was a great admiral.

The effect of the change was seen in the decrease in the relative proportion of soldiers to seamen carried in the ships. This fell from more than one-half the total complement to about one-fourth. Thus, in the year 1602, the total complement of the *Elizabeth*, of 684 tons burthen, was 500 — of whom 340 were mariners, 40 gunners, and 120 soldiers. This policy grew, and was finally pushed to an extreme in the year 1619, after which all the soldiers were removed and ships-of-war were manned entirely by seamen — a short-sighted conclusion, which showed a want of appreciation of the elementary fact, as true now as

then, that while the whole of the crew of a ship of war should be disciplined, all need not be skilled hands.

This happy combination of war and seamanship did not long continue. With the disappearance of the group of great Elizabethan seamen who had been bred in the atmosphere of war, the leadership of the Fleet passed into the hands of military men or courtiers—of men who were neither experienced soldiers nor skilled seamen. Their influence during the long peace, and the corrupt administration which followed the death of the great Queen, destroyed the force with which she had defeated the Armada. The deterioration of the Navy was rapid and complete, and its lamentable condition was shown by the failure of the Cadiz expedition in 1625. That enterprise was commanded by a soldier. The flag officers and many of the captains were landsmen. Mr Oppenheim has set forth the want of discipline, the bad equipment, and the ignorance of seamanship displayed in this disastrous expedition. It is a striking example of the necessity of combining nautical experience with military knowledge when conducting war operations at sea.

From this time up to the opening of the Civil War the naval commands continued in the hands of landsmen and courtiers. On the outbreak of

war knowledge again came to the front. At first trained seamen were employed as admirals and captains. Later, when the army became supreme, soldiers were appointed to the command of the Fleet; but two out of the three generals first selected had some knowledge of the sea. It was a partial return to the feudal system, but, unlike the days of Edward III., the military element did not become solely supreme. The advance of the naval art had increased the importance of seamanship. During the First Dutch War the pure military element represented by Blake and Monck was seen side by side with the nautical in the persons of Penn and Lawson. The presence of the soldier was partly due to political causes; but the appointment of a man like Monck, who had taken part in the expedition to Cadiz in 1625, could be defended on the ground of his experience of war and his knowledge of its leading principles. The seaman who possesses only a knowledge of seamanship, and has not well considered the problems connected with war on a large scale, is deficient in one of the essential qualifications of a naval commander.

With the Restoration came a partial return of the courtier element. The control of the Fleet passed from the leaders of the Army to those of the Court. The Duke of York and

Prince Rupert obtained commands. Spragge and others of their followers were given ships. But these men, who owed their positions to interest rather than to knowledge or experience, could not become predominant during the severe fighting of the Second and Third Dutch Wars. The well-tried soldier of the type of Monck, the skilled seaman and experienced fighter of the Penn and Lawson class, could not be neglected. As in the days of Drake, the men who combined practical knowledge of ships, including working the motive mechanism, with experience of war, were the deciding factors. The greatest admiral of this age, De Ruyter, was a man of this class. Such men invariably come to the front sooner or later in time of war. Hawke, St Vincent, Hood, and Nelson are the most striking instances. Each of these was a skilled seaman whose knowledge and experience enabled him to form an independent judgment in case of difficulty or accident. Officers of this stamp may be overlaid in time of peace by men with wealth, or courtly influence, or family interest, or political support, or by men trained in administrative posts, but in the end wide knowledge of war, combined with sea experience, are found to be worth more than any of these. Byng's defeat off Minorca was due to his unfitness for a position to which family

interest had raised him: Hawke's experience was called in to replace him. At Copenhagen the day was saved, not by Parker's wealth, but by Nelson's fiery genius and knowledge. The failure in Basque Roads is largely traceable to Gambier's long service in administrative posts on shore, which unfitted him for an active command.

With the First Dutch War, which broke out in the year 1652, came also the difficulty of manning the Fleet. The most simple and effective way of supplying the deficiency of seamen was to reverse the policy settled in the year 1619 during a time of peace, and to march soldiers on board. About 3000 or 4000 of these disciplined, yet unskilled, men were thus embarked, but the conditions, under which they went on board, were quite different from those in the preceding century. Instead of forming the fighting portion of the crew, they were now "to perform, as far as they are able, all service as seamen, and to be ordered in like capacity with the rest." It is noticeable that no military officers were embarked with them, sergeants being the highest grade. The unskilled soldier had taken his position on board the ship naturally and definitely as an auxiliary to the skilled seaman, a position which he has continued to occupy down to our own day. He proved so

useful that in every subsequent war, as in every serious one before that date, soldiers have formed part of the crews of H.M. ships. When the Second Dutch War broke out in 1664, their necessity was so far recognised that a regiment was specially formed for this service. Twelve hundred land soldiers were raised, "to be in readiness to be distributed into H.M. ships prepared for sea service." This regiment served as a nursery for seamen. For every man ordered to sea, another was recruited to keep the regiment at its established strength. As each man qualified as a seaman he was discharged and entered in the ship's books as such. An officer was embarked with the larger detachments. His status was fixed by an order issued in 1670, which directed him to command his men on their voyage, but that both he and those under him were to obey any orders received from their superior naval officers.

The regiment was disbanded in 1689 on the succession of William and Mary, but in the following year new marine regiments were raised. These were largely officered by naval officers, appear to have been a source of administrative difficulty, and were disbanded in 1699. On the outbreak of war in 1702 six regiments were raised, and continued in existence until the Peace of Utrecht in 1713. These were more on mili-

tary lines, and were no longer a nursery for seamen. A long interregnum now occurred until 1739, when, war breaking out, a marine force was raised and maintained until the Peace of Aix-la-Chapelle. With the outbreak of the Seven Years' War in 1755 the present corps of Royal Marines came into existence, and has since that date remained permanently embodied. Throughout the whole period, from the year 1664 to the great French War inclusive, it has been customary to supplement the marines by infantry of the line whenever difficulty occurred in manning the Fleet.

We have sketched in outline the changes which have taken place in the past. It remains to examine more closely the conditions which prevailed during the period of transition from sail to steam, together with those which will obtain in the future. But before doing so it is necessary to show the analogy between the sailing-ship and the steamer.

In the sailing-ship—

1. The captain directed generally.
2. The master steered, reported when it was necessary to tack or to alter course, and suggested alterations in speed when necessary.
3. The first lieutenant handled the sails—the motive mechanism.

Precisely the same division of duties holds on board a steamer. The only difference is, that the motive mechanism is worked by the engineer below instead of by the first lieutenant on deck. This difference is superficial, since the sailing-ship could be equally well manœuvred if the captain were cut off from the first lieutenant and compelled to transmit his orders by telegraph, as in the steamer. In either case, working the motive mechanism is entirely different to handling the ship. So much was this the case in a sailing ship-of-war that the master was rarely an adept at handling the sails, and the first lieutenant was seldom skilled in manœuvring the ship, but became so when placed in command. A close analogy is to be found between the officer of the forecastle of the sailing-ship and the engineer of the steamer. Each works the motive mechanism without paying any regard to the movement of the ship. Each is in the same relative position to the officer of the watch on deck, who is in charge of the ship. So much is this the case that it was not unusual to transmit orders by voice-pipe to the forecastle, as is now the practice to the engine-room. Again, during the first five years of an officer's service in a sailing-ship his time was occupied in learning the internal economy of a ship-of-war and the working of her sails

and armament. As a rule, he only acquired the art of handling a ship later. Precisely the same course might be followed in the steamer.

During the Nelsonian era, H.M. ships were manned by a body of sea officers and men who not only fought the ships but manœuvred them. These were known as the executive or military branch, and were, as a whole, well-trained fighters and skilled in working the motive mechanism, but were often not too well disciplined. A proportion were often landsmen who were neither skilled nor disciplined, but gradually became so. The master's class at this time still had a separate existence. He was charged with the navigation of the ship and the care of the then motive mechanism, as distinguished from its working, which was in the hands of the executive. His position gradually became more and more rudimentary and anomalous. Finally, the executive took charge of the navigation, the engineers of the new motive mechanism — including not only its care but its working — and the master's class has quite recently disappeared.

The skilled class of officer and man was supplemented by a highly drilled and disciplined force of marines, or soldiers of the regular army, who were not skilled seamen. Between the

disciplinary methods of the two bodies was a wide difference. By discipline is meant inculcating habits of care and attention, of order and subordination. In the case of the seamen, this object was formerly achieved through the medium of the motive mechanism, which compelled each individual to concentrate his attention on the ship,—her sails and equipment, or some part of them. He was thus taught to forget self, and to work in conjunction with other men for a common end. On the other hand, the discipline of the marines and soldiers has always depended upon drill, which consists for the most part in teaching men to do things in a particular way. They are thus brought to subserve their wills to that of another. In the one case, the discipline cultivates individual initiative and self-reliance, while subordinating self to the general good. In the other case, the discipline is repressive, and tends to formalism, which can only be counteracted by active service in the field, or in a lesser degree by service afloat.

With the advent of steam came a great change. The sea officers and men are now only charged with fighting the ship and directing her movements. They are no longer skilled in working the motive mechanism, which is not therefore now an aid to their discipline. This, combined with continuous service and the sys-

tem of instruction in harbour establishments and schools on shore, has tended to make them more and more dependent upon drill. They are gradually being assimilated to the marines. This tendency has been assisted by the absence of fighting at sea for nearly a century, and by the custom of employing naval brigades in the small wars of the last century, which gave to the Navy the only opportunity of seeing active service, and thus diverted attention from the sea to the land. The seaman forgot that his proper *rôle* is war at sea, and did not study it sufficiently. The marine omitted to remember that he was introduced to assist to man the ships rather than to fight on shore.

As a consequence, instead of the two classes of the sailing navy are found three in the steam navy :—

1. The executive or military element — the seamen—who fight the ship and manœuvre her, but do not work the motive mechanism. These formerly possessed both kinds of nautical skill, but have now lost the second.

2. The marines, who assist the military element to fight the ship. These have always been, and are now, without nautical skill of either kind.

3. The engineering element, who are not charged either with fighting the ship or with

manœuvring her, but with working the motive mechanism. These possess the second kind of nautical skill.

It has long been doubtful whether the seaman would gravitate towards the marine or towards the engineer—whether he would remain unskilled in working the motive mechanism, or again become skilled.

So long as the seaman and the marine remain equally without the second kind of nautical skill, and are separated from each only by the first kind, it is evident that the tendency of the two will be to come together. It is quite illogical to retain two distinct bodies of men doing nearly the same duties and trained in the same way. The essential difference between the seaman and marine was that the one possessed nautical skill and the other did not. This distinction between the two has almost disappeared, and they differ now little more than in the colour of their coats. In the Admiralty memorandum on the entry, training, and employment of the officers and men of the Royal Navy and Royal Marines presented to Parliament in December 1902, changes were proposed which tend to alter the character of the latter. Under those proposals marine officers will be entered under the same conditions and trained on the same system up to the age of about twenty as are

officers of the Navy.[1] Instructions have been issued under which the duties of naval and marine officers have been to some extent assimilated, and provision is to be made for a still further step in this direction in the future. The general trend has been to draw the marine closer to the Navy and further from the Army. If these Admiralty proposals hold, it is difficult to see how the marines can be retained. If the executive or military element and the marines are amalgamated, the conditions will approximate to those which held in the time of Henry VIII. We shall have—

1. An executive or military element charged with the fighting, and possessing nautical skill of the first kind and not of the second.
2. An engineer element with nautical skill of the second kind.

The two respectively corresponding in some degree to the soldier and seaman of that reign.

If the past is any guide for the future, it seems inevitable that, as in the days of Drake, the military element will gradually acquire the second kind of nautical skill. Otherwise they will not be able to utilise the ships to the best

[1] Written in November 1905.

advantage in war. A practical knowledge of working the machinery is as necessary to the officer who fights the ship now, as was the knowledge of working the sails to his predecessors. Without that knowledge he will be in the hands of his subordinates, and will not be able, in time of emergency, to judge correctly the extent to which he can press his ship. What real reliance was placed on a captain of the past who did not trust to his own knowledge and judgment when ordering sail to be increased or reduced? How greatly will the confidence of the captain of a destroyer be increased in the event of difficulty if he has himself practical knowledge of the working of her machinery.

The admirals and captains are the real responsible people. It is they who are held accountable in case of defeat, who reap the rewards in the event of victory. It is their honour and reputation which are principally at stake. No one else has the same authority and interest in securing the efficient working of the motive mechanism. In such a vital matter it is foolish to trust blindly to any subordinate, however competent. The loss of efficiency, the breakdowns, the waste of coal arising from the present absence of practical knowledge of the machinery on the part of the military branch of the navy, are matters of serious moment, and

cannot fail to attract the attention of the close observer. The famous Lord Dundonald struck the true note, when he pointed out that in the absence of practically acquired knowledge it is impossible to direct any operation properly, and that no man can become an efficient naval officer without such training. Few men have excelled Dundonald in his mastery of seamanship in all its branches and in his wide knowledge of war.

Again, a fear is sometimes expressed that if an officer devotes any time to driving engines he will no longer have the same handiness and fertility of resource as the seaman of the past. Why was the sailor handy? Was it not largely due to the practice of handling the old mechanism—the sails? He has now lost this, and is becoming less handy in consequence. Will he not regain part of that which he has lost if he works the new mechanism—the engines? Driving the engines requires as much care and attention as handling the sails. There is the same liability to accident, calling for instant action; the same contact with things, as distinguished from mere words, so essential to the man of action. We hold that the more the naval officer becomes acquainted with the motive mechanism, the more efficient he will become, with this proviso, that he also studies War. He must not allow himself to become the mere mechanic.

It should never be possible for some future Dundonald to depict him in the same light as the famous Jack Larmour, with his marling-spike and fid of grease. That historical personage was nothing more than an able seaman dressed in the clothes of an officer. Unlike him, the future naval officer must combine wide knowledge of war with practical experience in working the ship and her mechanisms. In a country where the military caste is predominant, as in feudal England, modern Germany or Japan, it may be possible to leave the motive mechanism in the hands of a separate body without risk of divided counsels or of clashing authority, but it will be with a loss of efficiency. It is not safe to do so in this country. If unity of action and efficiency are to be assured, both the fighting and the control of the ship, with all she contains, must be concentrated in the same hands.

It may be right that the executive or military element should absorb the engineers, but it is not clear that the marines should equally disappear. If the executive or military element acquire both kinds of nautical skill, and absorb both engineers and marines, the conditions will be the same as in the year 1619, when the ships were manned entirely by seamen nominally all skilled. As has been seen, the first great war showed that this was not practical. The dis-

ciplined and unskilled soldier was reintroduced. Such a man will always be required on board a ship to supplement those possessing that nautical skill which it is quite unnecessary to impart to every foremast man.

We are to remember that the men with nautical skill can only be reinforced from the seafaring population, whereas the marines are recruited from the general community. From that wide field no difficulty has ever been experienced in raising any number of men required. The advantage gained during a prolonged war will be great. The facility and rapidity with which they can be recruited, trained, and disciplined make them the readiest and most reliable form in which to add *personnel* to the Fleet if any sudden increase is required. They are the most efficient force in the Fleet for operations on land, for which the fitness of the sea officers and men varies inversely with their nautical skill. The cheap, drilled and disciplined, but nautically unskilled marines were evolved, and have existed during two centuries under conditions which still continue. It will be a mistake to alter in any way the constitution of this well-tried and renowned corps, or to replace them by short-service blue-jackets imperfectly skilled. In time of war disciplined men will be required to complete our crews, of

whom some may be rough and difficult to control in the future, as in the past.

Our arguments have shown that the change from sail to steam has not altered the principles underlying the control and working of a ship of war. They are the same now as in the days of Drake and Nelson. The soldier without nautical skill can still find room on board a ship to fill a useful *rôle*. The naval officer still requires nautical skill combined with military knowledge. But the nautical skill is of a different kind. Driving engines has come to replace handling sails.

IV.

THE 1902 SCHEME.[1]

THE changes in naval education and training introduced by the Admiralty in the year 1902 afford a wide field for legitimate difference of opinion. On the one hand are those officers who, knowing little or nothing about steam machinery, think its handling, care, and maintenance cannot be combined with the control and management of the ship. They magnify unduly the present work of the naval officer, forgetting that the abolition of sails has reduced its difficulties; they are awed by the unknown duties of the engine-room; they have come to believe that the same man cannot master the knowledge required to work the motive mechanism combined with that necessary to handle the ship. These officers forget that for three centuries this was really the practice. Throughout the whole of the sailing era the men who handled the ship were skilled

[1] Morning Post, in June 1906.

in working the sails. They do not realise that if the time formerly given to the sails is now devoted to the engines, the latter will be as familiar to future officers as the former were to their predecessors. On the other side, is the engineering profession, who, knowing little or nothing either about the sea or about war, think that a very high scientific knowledge of engineering in the larger sense is necessary. They do not go so far as to say that the same man cannot combine the management of the ship with that of the engines, but their argument amounts to that, because they place engineering knowledge so high that in acquiring it the naval officer would not only sacrifice other knowledge more necessary to him, but would acquire a mathematical and mechanical habit of mind which would unfit him to deal with the unexpected difficulties arising in war. They also unduly magnify their calling; they confuse the care and management of machinery with its design and construction; they forget that hundreds of engines are run and maintained in very efficient order by men who have not a scientific but a practical knowledge of their business. The first school wish to limit the military branch to navigating and fighting the ship, and desire to retain a special body of officers called engineers to control the motive

mechanism—an arrangement quite contrary to the practice of the sailing Navy. The second school wish to see the engineering profession assume greater importance in the Navy. They appear to be divided in their aim. Some seem to lean towards a separate engineer branch with greatly increased power and authority, which would mean dual control of the mobility of the ships and increased friction between the military and engineer branches. Others appear to wish the control of the ship and engines to be combined in the same hands, but this is coupled with a demand for a standard of engineering knowledge more appropriate to a Penn, a Maudslay, or a Parsons than to a naval officer.

Between these two schools of thought stands a third, who believe that the naval officer of the future should have the same kind of training as his predecessor of the past. These hold that he should understand the practical working of a ship and her mechanisms as well as Drake, Nelson, and their followers, and that like them he should be trained to act as a leader in war. They recognise that the first is secondary and only a means to an end, whereas the second is the very end and aim of a military Navy. They remember that in the past the practical knowledge referred to

has always been indispensable to success in war, but they also believe that too much attention to its theoretical aspect will be unnecessary and extremely detrimental. The aim of this school is to merge the engineer completely in the naval officer—to make the military branch completely master of the motive mechanism without sacrificing his military efficiency. Reasoning from the analogous conditions of the sailing Navy, they believe this to be quite practicable provided the principles underlying the well-tried practice of the past are followed. These principles consist in inculcating early in life a practical knowledge of working a ship and her mechanisms by bringing the future officer into actual contact with, and making him take part in, the life and work of a ship. This plan possesses the additional advantage of placing him in contact with human nature, of which a knowledge is most important in carrying out war operations. This training is a true education much more real and thorough than that derived from books, since the individual, gathering his information from actual experience, develops powers of self-reliance and observation which enable him to form his own opinions based on things as they are instead of taking them at second-hand from books. If to this habit of mind is afterwards added a

course which teaches him the method necessary to acquire a thorough mastery of some one branch of knowledge, the future officer will be well equipped to grapple with the difficulties of his future career.

The Admiralty scheme, so far as it has been possible to understand it, appears to be none of these. The difficulty in grasping the real aim of those who started it is due to the absence of any statesmanlike exposition of policy. No State paper worthy of the theme has been issued. The official memoranda and statements published exhibit so much confusion of thought and vacillation of purpose that it is difficult to believe the authors of the original Memorandum understood where they were going. The 1902 Memorandum not only dealt with the entry, training, and future career of the military and engineer branches of the Navy, but also with the future marine officer. The amalgamation of the executives with the engineers is a subject widely different from the future of the marines. Each involves many difficult problems, and requires prolonged and close investigation. Instead of thorough treatment, the Memorandum dealt with each superficially, and left it in a state of uncertainty. But not content with these large questions, a number of minor matters were included and

helped to confuse the issue. Much of the professional distrust towards the scheme was due to this Memorandum, which showed such an imperfect knowledge of the questions raised, and left room for so much misunderstanding. Those who had long hoped for reform feared that the great opportunity was being misused. The distrust was accentuated when it was understood that any expression of professional opinion was discouraged. Had the authors of the scheme thoroughly understood the question, and been aware of the strength of their case, they would have encouraged discussion. They would have held the conviction that the amalgamation of the executives with the engineers was as inevitable as was that of the soldier and seaman in the days of Drake, and that discussion could only render this quite clear. But not thoroughly understanding, they had no confidence in themselves. Their immature views failed to convince those who had not previously considered the question, and alienated those who had already thought it out, and might have supported them. The crudities and defects in the original scheme of the year 1902 became so apparent, and the demands for future guidance so pressing, that a committee was appointed, July 1905, to consider further action. In a Memorandum dated November 30, and signed

by Lord Cawdor, the Admiralty made known the terms of reference, and explained the action they proposed to take. They stated that their intention was eventually to abolish the separate classes of executive, engineer, and marine officers, and to substitute for them one single class, of whom some will have special knowledge in one particular branch, but all will have a general knowledge of the duties of all branches, and will have opportunities of fitting themselves for the position of captain of a ship. The executive-engineer question was again mixed up with the marine problem, and the issue was further confused by the introduction of a third knotty point. This was the engine-driving warrant officer, who was to be promoted from the stoker class, and was to do work which has hitherto been allotted to the engine-room artificer.

No sufficient reason for amalgamating the executives with the engineers has ever been given officially. The Douglas Committee merely expressed the opinion that a distinct classification is not necessary, and that efficiency can be assured without it. The Cawdor Memorandum based the new departure on the alleged success of the two years' training at Osborne and on the experience gained there. A weaker argument would be difficult to find. From a short ex-

perience with boys under fifteen years of age, how is it possible to judge the wisdom of such a wide-reaching policy? The Admiralty position, which might have been made strong, is weak. Had they based their case on the history and practice of the past, when the same men fought the ship and handled the motive mechanism, they would have founded it on an impregnable rock which could not be undermined. The Osborne experience could then have been used as a secondary argument to show that the policy promised to be feasible. They would have been able to stand on the one hand against the section of naval officers who are opposed to the motive mechanism being controlled by the military branch, as was the practice of the past, and on the other hand against the engineering profession, who want to see the machinery of his Majesty's ships in charge of men with the scientific knowledge of a Parsons. To the first they could have replied, This control was necessary in the past, and it is equally so now. To the second they could have said, We mean to take so much of your knowledge as the past has shown to be necessary for our practical requirements and no more. Unfortunately the Selborne Memorandum started the question on wrong lines. Instead of showing the fundamental resemblance between the present and

the past, it dwelt on the superficial difference, and thus sacrificed the strength which the new policy would have gained had it been understood that we were simply returning to the old practice. As the campaign has advanced the faulty strategy has become more evident, and has continued to act as a continual drag on the movement. The Cawdor Memorandum combined against the scheme all the forces—the conservative naval element, the engineering profession, the marines, and the trades unions. Each attacked a part of it. The unfortunate result is that the main issue—the executive-engineer amalgamation—is imperilled.

Under the scheme of 1902 the naval cadet is entered at the average age of 12⅔ years. He spends two years at Osborne College, and is then transferred to Dartmouth, where he remains two further years on shore, and receives more advanced instruction. He will not go to sea until he is about 16⅔ years of age. The future admiral is now entered at a youthful age, not, as in the past, that he may become early accustomed to a sea life and learn his practical duties in the best practical school—the ship—but that he may be given a special education on shore. The system of instruction at these colleges is believed to be good. In them an attempt is made to combine naval discipline and practice with the best

modern school education. The keynote to the whole is that practice shall precede, and be closely followed by, theory. The practice of the workshop and the steamboat is supplemented by the teaching of the schoolroom. Even in the theoretical instruction practical utility is kept in the foreground. Thus in languages speaking comes before grammar; in mathematics their application to the solution of some practical problem serves as an introduction to a theory. The precedence thus given to practice is in accordance with naval tradition. The great seamen of the past all began by learning the practical part of their profession. But what a gap between their practice and that of these colleges! Compare the early training of Drake and Nelson with that of these young men! The new scheme accepts the importance of placing practice in the forefront, but is inconsistent in that actual touch with men, with realities, and with responsibility is pushed back at least two years. Time alone can show whether the excellence of the instruction will counterbalance the loss due to this cause. Whatever be the outcome, no well-balanced mind can doubt that the practice should not be pushed back further. Is there any chance of this? We have to consider the forces at work. At these colleges, and generally on the naval education question, two

different classes of mind are in contact. The naval officer, fresh from touch with men and things, but without much faith in theory, is face to face with the educationalist impressed with the importance of knowledge derived from books but unaccustomed to practical affairs. Reciprocal action of the one on the other and the common environment will produce a gradual change. At these colleges the naval officer is at a disadvantage; he is away from his own element, and for the most part must constantly struggle to convert into a reality the "make-believe" inseparable from his surroundings. On the other hand, the educationalist or schoolmaster does not suffer from these disabilities, and, moreover, will not be so constantly changed.

On the whole, it seems probable that the "atmosphere" of these colleges and the general naval education will tend to become less and less practical, and that the difficulty will be to prevent naval training becoming formal and scholastic rather than practical. That this is a real danger can be proved by examining recent educational policy. First, the age on entry has been raised, and will in future average nearly 13 instead of $12\frac{2}{3}$. This postpones the time of going to sea, and thus favours scholastic as against practical training. Second, the Selborne Memorandum of 1902 stated that

it was not decided whether at the end of the Dartmouth course the midshipman should go to a training cruiser or direct to the Fleet. The Cawdor Memorandum of 1905 says that they will join a sea-going cruiser for seven months. As naval instructors are to be carried by that ship, and the final examination is not to be held until these lads leave her, it is evident that scholastic training will be favoured at the expense of practical work. Third, Lord Selborne was emphatic that "at whatever period they are posted to ordinarily commissioned battleships and cruisers, compulsory school on board these ships shall cease." The Cawdor Memorandum confirms the abolition of the naval instructor, but substitutes for him a specially instructed lieutenant, who is to assist the cadets to keep up the knowledge they have acquired. This means that the naval instructor will be revived under another name, and as both instructors and instructed will still have hanging over them examinations which give accelerated promotion to the latter, compulsory school will not cease. Fourth, on leaving the training cruiser, midshipmen are to be drafted into the Fleet in batches of twelve, shepherded by the before-mentioned special lieutenant. This is favourable to the acquisition of knowledge by an artificial system of instruction rather than

by taking part in the regular duties of the ship and by doing work in the ordinary course of service. These are some of the reasons why the new training seems to be moving in the wrong direction, and to be becoming scholastic rather than practical, but they are by no means all. Throughout the Cawdor Memorandum and the Douglas Report much emphasis is laid on courses of instruction and examinations, but hardly any reference is made to the training and education given by taking an active part in the service on board a commissioned ship in the Fleet. This side of the question has been almost entirely neglected, notwithstanding that it is by far the most important. If the omission is in accordance with naval opinion, a very serious state of affairs is revealed, because it shows that the naval mind is becoming scholastic rather than practical. Had due weight been given to the value of practical experience, and had the college training inspired its authors with confidence, the training cruiser would be discarded and the cadet would be sent direct into the Fleet, to find his level in assisting to perform its ordinary duties. It is no doubt true that after being six months in a training cruiser the cadet falls more readily into his place on board an ordinary ship than if he had gone straight to

her, but this is not the point. The question is whether, at the end of six months, he would not be farther advanced if he had passed them on board the ordinary ship rather than on board the training cruiser. The Douglas Committee rightly lay stress on the necessity of giving him responsible work. They might have added that responsibility cannot be laid upon him too early in his career. This can evidently be done more effectively on board an ordinary ship carrying a few midshipmen than it can be on a small cruiser with a large number. In the one case the work is all real, in the other it tends to become artificial and formal. This is the reason why, as a school for a young officer, the Fleet itself is better than a special training ship. Our view is that the cadet should go straight from Dartmouth into the Fleet.

The system of training proposed after leaving the training cruiser requires particular notice. The midshipman is to pass three years at sea, and during that time is to be constantly under instruction and examination. He is to be passed on from the commander to the chief engineer, the gunnery lieutenant, the torpedo lieutenant, the navigating officer, for instruction. Not a word is said about doing any real work. He is to be annually examined not only in the practical subjects which occupy

his attention, but in general mathematics, to which he is not supposed to devote any time. The examinations, even in practical subjects, are not to be *vivâ voce* and searching, but on paper and superficial. The papers are to be sent from home. The general effect will be that stress will be laid on theoretical instruction and examinations, while practical ability to do the work of the Navy will be little encouraged. This is quite wrong. Why cannot the midshipman on board a sea-going ship be allowed to concentrate his attention on learning his practical duties? Why should he be pursued with annual examinations on scholastic questions? Is it feared that he will forget what he has been taught at Dartmouth? Be assured that if he does forget, it will be because the knowledge is of no use to him. If it is of use, he will apply it and not forget. Again, why should annual examinations in practical subjects be necessary? Officers employed in the work of the Fleet are continually under examination. To manage an engine, to sail a boat, or to manage the signals on the bridge of a battleship, is a far better test of practical ability than any formal examination.

After three years' service in the Fleet the midshipman is to be examined in seamanship and engineering by the officers of the Fleet,

and, having passed, is to be sent to England to be examined in the subjects he learnt at Dartmouth, and then to undergo courses and examinations on shore in pilotage, gunnery, and torpedo. This will take six months, after which he will be available for sea as a sub-lieutenant at an average age of 21 years. The abler officers are to be detained six months more on shore to undergo an advanced scholastic course. Their average age on going to sea will be 21½ years. As one year's sea service as sub-lieutenant is required as a minimum, the average age of becoming eligible for the rank of lieutenant will be 22½ years and the sea service 4½ years. Why is he to be examined in scholastic subjects at this stage? They are quite out of place. Why is he to be taken out of his ship and landed in England? The examination for the rank of lieutenant should be held to determine whether he is competent to take charge of a ship, to drive her engines, and to manage her armament. These are practical matters much better learnt on board a sea-going ship than in any shore establishment. Sea experience is the essential thing at this period. The year which it is proposed to devote to courses on shore would be much more profitably spent at sea, where the examinations should be held. The

special study of any particular subject can be much more effectively and thoroughly continued at a later stage after the young officer has acquired that thorough practical knowledge which is so essential to his ultimate success—that is to say, after he has been five years at sea and has become a lieutenant.

If the system of 1902 is modified in the direction hereafter proposed, naval cadets entered and brought up under it should become more efficient officers than their immediate predecessors, whether of the military or engineer branches. Trained to the management of the motive mechanism, they will know more about their ships than the present executive or military branch, because they will possess the dual nautical skill lacking to that class of officer since the introduction of steam. Whether they will become equal to their efficient forefathers of the great past will depend upon whether the right bent is given to their early training. In the future, as in the past, this will undoubtedly be found in the direction of a large practical sea experience. They are likely to become better sea-going engineers than their predecessors trained at Keyham. Although not as good workmen, their knowledge of the principles should be as good; while their practical experience in

driving engines, managing boilers, and of ship life generally, should be greater. The reasons for the difference are to be found in a more suitable training. The truth of this view can be judged by comparing the career of the Keyham student with that of the Osborne cadet up to the age of 20½. At that age the majority of the former are ready to go to sea for the first time; and the latter, having completed three years' service at sea in the Fleet, becomes a commissioned officer. The Keyham student enters between the ages of 14½ and 16½—average 15½. After four years' practical and theoretical training in the workshops and studies, and after passing an examination, he is commissioned as an engineer sub-lieutenant. Those who qualify are sent to Greenwich College for a theoretical course of nine months. This completes the course of all except a small minority who are destined to fill the higher engineering posts at the dockyards and at the Admiralty. These remain two years longer at the College. They now have a certain amount of theoretical knowledge, are said to be good mechanics, but are without any sea training or practical experience with machinery and boilers. On the other hand, the Osborne cadet enters at an average age of 12$\frac{10}{12}$ years. After four years'

instruction of a superior kind, in which practical work in the shops is combined with theoretical studies, he is to be sent to sea first in a training cruiser for six months and afterwards for three years in the Fleet. He is then to pass for the rank of sub-lieutenant. The two young men are now the same age, 20½. The one has been trained on shore, the other afloat: the one is more at home in the workshop, and is probably the better mechanic; the other is familiar with the engine-room, and excels in his knowledge of a ship and her mechanisms. The outlook of the first has been narrow, and he has never borne responsibility; the second has been about the world, and is already accustomed to command. Who can doubt which will eventually become the more useful man afloat? There is, however, a most important proviso. The success of the Osborne cadet depends upon the efficiency of the sea training. If he goes to sea with a clear understanding that he is an officer, and as such is to take an increasing share in the work of the ship as his experience grows; that he is equally to drive engines or to sail boats, assuming responsibility in either case—if such is the case all will be well. But if no confidence is placed in him; if he is treated as a schoolboy and not as an officer; if his

instruction is considered more important than his work; if ability to pass examinations rather than practical knowledge, and if capacity to write rather than to act are the tests of efficiency—then the results will be bad.

It is because the Cawdor Memorandum and the Douglas Committee both show a decided leaning towards the pedagogic idea of treating the midshipman as a schoolboy rather than as an officer that doubts exist as to the success of the scheme. If its authors will only have faith in their own work; if they will abolish the expensive training cruiser and send the midshipman direct into the Fleet to find his level in learning his practical duties, and not divert his attention by too numerous examinations, they will be astonished at the result. This will be specially so if, instead of bringing the officer home at the age of 20½ for short courses of instruction, they leave him at sea for at least another year to extend his nautical and military skill by further practical experience afloat. But they must take the Navy into their confidence, and clearly explain that the nautical skill now required includes driving engines, and that the modern officer must be equally at home in the engine-room and on the bridge. As soon as the real aim is understood its necessity and feasibility will be acknowledged, and no fear need be felt

that the new cadet will not be given every opportunity to fit himself for his new career. The danger is quite the other way. It is more than likely that at first opinion will be violently swayed in the new direction, and that too much attention will be devoted to machinery. If the new conditions have been fairly set forth in this study, and if the comparison between the present and the past is valid, the reader will, perhaps, admit that the new scheme, modified in the directions pointed out, should produce officers fully capable of handling the machinery of his Majesty's ships at sea. No fear need be entertained that they will not be able to hold their own against the artificers because they will be less skilled workmen with their hands. In the parallel case of the lieutenant and boatswain no such difficulty ever arose. The key to the whole situation lies in knowing how to work and control the machinery, which is an affair of the head, rather than in ability to repair it, which is the work of the hand. In the end headwork always governs handwork.

The great problem still unsolved lies in providing men suitable for service on shore in the dockyards and at the Admiralty. Such men must possess the very highest professional engineering knowledge. With this object in view, the new scheme arranges that a sub-lieutenant shall

volunteer to specialise in engineering at the age of 22½, when he is to be sent to the dockyards and Greenwich College for a three years' course of instruction, mostly theoretical. At the end of this course he is to go to sea for another year, after which he is to be eligible for shore appointments. He will then be 26½ years of age, and will be known as a lieutenant (E.†). His previous career will have included—

	Shore service. Years.	Sea service. Years.
At Osborne and Dartmouth Colleges	4	...
In the training cruiser	...	½
In the Fleet as midshipman	...	3
At courses on shore	1	...
In the Fleet as sub-lieutenant	...	1
In the dockyard and at Greenwich College	3	...
In the Fleet as lieutenant	...	1
	8	5½

Compare this with the Keyham trained officer who completes his theoretical and workshop training at the age of 22½ and then goes to sea for three years, after which he becomes eligible for shore appointments. His career up to the age of 26½ will have included—

	Shore service. Years.	Sea service. Years.
At Keyham College and in dockyard	4	...
At Greenwich College and in dockyards	3	...
At sea in the Fleet	...	3
In a dockyard	1	...
	8	3

Opinions will differ as to which is the better training for the special positions in question, but on the whole it would seem that concentration on one subject should start the Keyham graduate with the closer grip of large engineering questions and of dockyard work generally.

The real difficulty of reconciling the new scheme with practical necessity begins with this highly-trained engineer expert. The opposing interests of the sea and the shore—of the ship and the dockyard—commence to clash seriously. The larger military and nautical questions differ totally from the higher mechanical problems. They each require not only special experience but long, continuous thought before they can be mastered. If the same mind attempts to deal with two such widely differing subjects, the resulting mental friction must lead to failure.

The Sub-Committee on Engineering Training (Report 5 of Blue-book) saw the difficulty, but do not seem to have appreciated its full bearing. They recommend that officers shall choose engineering as a speciality at the age of 24, before completing the extended engineering course of three years, and that they shall continuously perform engineering duties. This is quite sound for officers who are to fill positions in the dockyard, but is entirely inconsistent with the proposal that these officers

shall perform military duties at sea, because it assumes that the military side of the profession does not require as much experience and thought as the engineering side. This will be best understood by taking a concrete case. A lieutenant (E.†), after his first three years' service in a dockyard, goes to sea. He will be 29½ years of age and a lieutenant of seven years' seniority, but will have only one year's sea experience in that rank, and out of 16½ years' service will have spent only one-third at sea. His position will be one of some responsibility. He may be one of the senior officers, and may find himself at any time in command. Can it be right to entrust an officer having such small sea experience with the charge of a ship? It cannot be so. As he rises in rank, his knowledge of the sea will not improve. He will never have been really in touch with it, and such snippets of sea service as fall to his lot will not mend matters. But notwithstanding his inexperience, he is to remain eligible for command afloat. Those who have closely watched the evolution of naval thought, and are aware of the subordinate position to which the military side of the profession has been relegated by the *matériel* side, cannot but be alarmed at the possibilities which this opens up for the future. If the foregoing argument is accepted, the conclusion is

not in doubt. The highest class of mechanical engineer, whose chief concern is to design and build engines, cannot be combined with the sea officer, whose business it is to work, manage, and keep them efficient. The thoughts of the one centre in the factory on land, while those of the other are focussed on the ship at sea. The engine designer and builder needs no more sea experience than the ship constructor. Both gain their practical experience on land—the one in the factory, the other in the shipyard. To send either the one or the other to sea for more than one or two years is to impair his efficiency. If the sea-going engineer is to be merged in the executive branch, and if the highest engineering talent is to be at the service of the Admiralty, the dockyard engineer must be entirely separated from the sea service.

No question is so little understood as the relation between the Marines and the Navy. That useful and renowned corps was not originally formed as an instrument to repress the seamen, but because it provided cheaply and readily a supply of reliable and disciplined men to complete deficiencies when the Fleet was mobilised. It is true that in the end experience showed the marines to be a useful counterpoise to the seamen, but this advantage was quite secondary. Necessity begot them in the distant past,

necessity has prolonged their existence to the present, and necessity will continue their being in the future. From time immemorial soldiers have formed part of the crews of the King's ships. When the supply of seamen was short during the stress of the Dutch wars in the seventeenth century, what more natural than to revert to the ancient practice and march regiments of soldiers on board to fill their places? When the value of these men was realised, what more reasonable than to raise special regiments as marines for service in the Fleet, and to eliminate dual control by transferring them from the rule of the Army to that of the Admiralty? This was the final outcome. The first act occurred when the Second Dutch War broke out in the year 1664, and a regiment was for the first time specially raised for the marine service. It was disbanded in the year 1689; but in the following year, and at the outbreak of each subsequent war, marine regiments were raised. They were invariably disbanded on the conclusion of peace. It was not until the year 1755 that the present marine corps came into existence and remained permanently embodied. We repeat that marines are, and always have been, enlisted to facilitate the manning of the Fleet. What are their characteristics? Cheapness, discipline, and want of

nautical skill. Their discipline is due to their military methods and to military drill, which is the quickest method of getting men in hand and of making them available for war. Hence they are particularly valuable when a rapid expansion of the naval *personnel* is required. Their want of nautical skill is of no moment, as on board all ships, whether sailing or steam, a large amount of unskilled work must be done for which they are well suited. Their cheapness is due to their want of nautical skill, and to the comparatively short training required. As is proved by the proposal of Lord St Vincent that all infantry regiments of the line should be embarked in rotation as marines, sea experience was not considered necessary for them during the sailing era, and is as little required now. Their status afloat has always been that of the disciplined landsman.

On the other hand, the characteristic of the seaman has always been his nautical skill, which consists not only in manœuvring and navigating the ship, but in managing the motive mechanism—the sails of the past and the steam machinery of the future. This means longer training, larger sea experience, and, in consequence, greater cost in the case of the seaman than of the marine. The essential difference between the two, whether officer or man, has

always been that the one possesses nautical skill and the other does not. The 1902 scheme will upset this arrangement. The corps is to be officered not by soldiers trained according to the military methods which have been the main cause of its past glory and success, but by a type of naval officers possessed of an indifferent kind of nautical skill — that is, by officers of an inferior stamp. The future officer of marines, after passing through the same training at college and afloat as other executive officers, will, on being made a lieutenant, volunteer for marine duties. At this time he will be about 22½ years of age, and will have been 4½ years at sea, of which only one year as commissioned officer. He will not yet have had sufficient opportunity to become a seaman, and will henceforth turn his thoughts and attention from the sea to the land. He will devote eighteen months to the study of questions connected with operations on land, and will then be held competent, as the sub-committee grandiloquently put it, to "undertake the full responsibility of military adviser to the officer commanding the ship or squadron to which he is appointed." This is delicious. Conceive this marine bantling, spoon-fed on superficial courses, offering advice to a Drake, a Nelson, or a Dundonald! Picture to the mind his interview

with St Vincent! The sense of humour must surely have been absent from the council table when that passage was penned.

It has been said that on being made a lieutenant the future marine specialist will not yet have become a seaman. Looking to the bent given to his thoughts, to the work allotted to him, and to the limited time which he may be expected to serve at sea, it is difficult to understand how he can ever become thoroughly familiar with the management of a ship and her mechanisms. As he is to remain an executive naval officer, and is to be eligible for command, this is a serious omission in his training. It is urged that the future marine specialist will have as much sea experience as some of the gunnery and torpedo specialists of the present day. The argument cannot be accepted as a valid defence, because it is believed that many of those officers have had too much shore service, which has been forcibly brought home to them on afterwards going to sea.

The full effect of replacing the present marine officers by naval officers can only be understood by comprehending the difference between military and naval training and ideals. To the military mind drill is the foundation of discipline and order; to the naval mind nautical skill is the basis on which rests the training,

organisation, and discipline of the Fleet. It so happens that during the past generation the naval officer and man has gradually lost the principal part of his nautical skill owing to the disappearance of sails. He has shown a strong tendency to replace it by military drill, but has never altogether reconciled himself to doing so. The proposal that he should officer the marines is a particular phase of this movement, and is a warning that the naval ideal is shifting from the sea to the land. The idea of officering the marines from the Navy is by no means new. The plan was tried in the time of William III. The marine force raised in the year 1690 was essentially naval in character. Many of the officers were naval officers, and held dual commissions, as is now again proposed. That attempt to govern a military force by naval methods was a distinct failure, and the force was disbanded in the year 1699. When a marine force was again raised, care was taken to eliminate the naval officer, and to work it on entirely military lines. A century and a half of success has borne witness to the correctness of the policy. If the new plan is continued, history will no doubt repeat itself, since the future naval officer is acquiring a new kind of nautical skill which will tend to draw him towards the sea and away from

the military drill idea. This will make him as unsuited as his ancestors to control a corps on military methods. The Douglas Committee express the view that "the officering of the Royal Marines with naval officers will undoubtedly alter the general nature of the whole corps, and that it is difficult to foresee its ultimate effect on the maintenance of the marines as a body separate to the seamen." They do not attempt to defend the policy, but add that this is a matter of grave Admiralty policy, and thus shirk the whole question. The Minority report gives reasons why the marines will speedily deteriorate and will probably pass away. The afterthought in the postscript to the report, which essays to refute the view that the marine will disappear if the new scheme is carried out, is unfortunate, and shows how little the question is really understood. The reason adduced is that the marine need not disappear any more than the stoker, because the proposal to unify the executive and engineer officers will not lead to the merging of the stokers with the seamen. The bottom is knocked out of this argument by the fact that this amalgamation is slowly being prepared by the increasing participation of the seamen in the duties of the stokehold and the attention given to their mechanical training. As soon as the seaman, including

officer and man, acquires the new nautical skill, the engineer and stoker as separate entities will be absorbed and will disappear. The future of the marines under the influence of the new scheme will be different. For reasons easily explained, it appears to be certain that they will deteriorate. The officers will neither have the same opportunities as other naval officers of acquiring nautical skill, nor the same facilities as military officers of learning military methods. They cannot fail to be inferior both as seamen and as soldiers. The men will not be properly trained and disciplined in military methods if their officers are brought up under another system. They will be inferior soldiers. On the other hand, the disappearance of the marine seems to be unlikely, because a disciplined soldier without nautical skill is a recognised want on board a ship-of-war. If these arguments are sound, and if the marines are neither to deteriorate nor to disappear, it will be perhaps admitted that their officers must be retained as a distinct corps, and their military training continued on Army lines.

It is important to note the constitution of the Douglas Committee which recommended changes vital to the future of the marines. It was composed of one admiral, two captains R.N., one commander R.N., one marine officer, three engineer

officers, a professor of engineering, and an Admiralty clerk. The marine officer and one of the captains did not concur with the remainder, and signed a minority report. The other captain was a man of small, and the commander of still smaller, experience in command at sea. The question at issue was not an engineering matter, but the future of the marines and the manning of the Fleet. On such a question the committee did not embody the experience and knowledge necessary to deal with it, and they did not seek to supply their own deficiencies by obtaining evidence from those who had. They called only five marine officers as witnesses, and omitted to summon the Deputy Adjutant-General, who is the head of the corps. No flag officer or captain in the Navy was examined on this particular subject. Can it be a matter of surprise that the portion of the report which deals with the marines has not met with support from the Naval Service?

V.

THE POLICY OF "SCRAPPING."[1]

OUT of twenty-eight so-called obsolete ships sold at Chatham Dockyard on April 4, 1905, thirteen were less than eighteen years old but only fetched £91,250, although their original cost was nearly £2,500,000. This will be admitted to be a startling fact, when it is understood that these thirteen ships were each capable of efficient war service, and that among them were several fully a match for ships used during the Russo-Japanese War.

This particular sale increased the misgiving aroused in the public mind by the extraordinary statement made by Mr Balfour at Glasgow in January 1905, that about 130 ships had been removed from the list of the Navy without weakening its strength. To the plain man this seemed so improbable that he began to think there must be exaggeration or error somewhere

[1] Blackwood's Magazine, June 1905.

—that the Prime Minister must have been misled by professional opinion on a technical question. It was hard to believe that the Admiralty could have stultified themselves to the extent indicated; but that they were more or less aware of the unsound position in which their hasty and impulsive action had placed them was shown by the loose and confusing explanations offered to Parliament. The debates, memoranda, and returns all point to a want of clear understanding of the nature and extent of the demands which war will force on the Navy. In Article I. this misconception was attributed to neglect of the study of war. We now propose to show, from the experience of former wars, what these demands may be in the future.

The difficulties in which the Admiralty find themselves appear to be due to a want of clear comprehension of the nature of war. They seem to have pictured to themselves one particular sort of war in which great fleets and squadrons are alone to bear a part, whereas, as will be shown, there have been in the past various sorts of wars, each having its peculiarities and requiring special treatment. That the future, like the past, will produce differences can be shown from the nature of war, but space does not permit here more than an indication of the line of argument.

War is the result of a difference of opinion based on a real or supposed clashing of interests between two nations or groups of nations. When this difference cannot be reconciled by reason and argument—by diplomacy—and is founded on opposing interests of sufficient importance to justify a resort to force, the one party tries to compel the other to accept its views. Thus the Venezuela boundary was the subject of a difference of opinion between Great Britain and the United States, but the interests involved were held to be insufficient to justify a resort to force, and were reconciled by diplomacy. On the other hand, the Russo-Japanese War is an instance of the collision of grave and important interests. The presence of Russia in Manchuria and Korea was considered to be a menace to the independence and liberty of Japan. A difference so vital could not be settled by diplomacy, and justified a resort to force.

The manner of applying the pressure required to produce a change of view varies, but whatever form the pressure takes, it rests ultimately on physical force,—in other words, on fighting. As the instrument used for fighting is the armed force of the nation, the end and aim is either to convince the opponent that resistance is hopeless, as was the case during the inter-

national blockade of the Piræus in 1886, or to destroy, or to isolate, his armed force as a whole or in part.

The general arrangements required depend upon the character of the war, which is influenced by a great number of conflicting considerations. Among these may be mentioned the political object as one of the principal. For instance, in the Russo-Japanese War if Japan had aimed only at defeating Russia at sea, and had not been under the political necessity of driving her out of Manchuria, the general plan would have been altogether different. Whatever may be the influence of political and other considerations on the arrangements, the result of the fight is ultimately the ruling factor. The strategic dispositions of the armed force must therefore be such that the general results of the fighting, if there be any, are favourable. At the decisive point superiority of fighting power must be assured. Not only must the great battle be won, but detachments, and especially important ones, must not be unnecessarily exposed to defeat.

That wars differ in character, and that the nature of the force required to carry them on varies, can be best shown by reference to particular examples.

In the Dutch wars of the seventeenth century the differences between England and Holland were due chiefly to clashing commercial interests, and to their mutual jealousy of sea-power. Each nation aimed at the destruction of the military navy of the other, with a view to the commercial advantages which would accrue to the victor. The problem presented itself in its most simple and direct form. The principal field of action — the North Sea and the English Channel — was so small and confined that the hostile navies came directly into collision. Both sides necessarily concentrated all their forces, which met and fought a number of great battles. The number and power of the capital ships became of supreme importance. The ship of the line or battleship was steadily developed, and the art of handling large fleets was evolved. The war is an example of concentration carried to an extreme.

In the American Civil War, 1861-65, the conditions were altogether different. The object of the war was to preserve the union—to convince the Southern people that separation from the North was impracticable. The method of doing this was the process of exhaustion. The power of the South was undermined by cutting off its supplies through the action of a close blockade, and was eventually destroyed by armies which

were largely supported from over-sea, and in some instances transported by water. The Confederate States were practically without a navy, and in consequence ships of the smallest fighting power were adequate to maintain this blockade along a coast 3000 miles in extent. Not only were ships of the line quite unnecessary to the North, but even powerful cruisers had no place in a war which was more effectively carried on by small ships. The operations are an example of extreme dispersion, and are thus the very opposite to those of the Dutch wars.

The Russo-Japanese War was differentiated widely both from the Dutch wars of the seventeenth century and from the American Civil War. Unlike the former, it was not chiefly commercial and maritime. It differed from the latter, in that there was no question of overcoming the will of a whole nation by the slow process of exhaustion. The object of Japan was to drive the Russian military forces out of Korea and Manchuria, where their presence was a menace to the liberties of the Island Empire. This involved the defeat and isolation of the Russian fleet, with a view to ensuring a free passage to the Japanese army across the sea, and following that, to the destruction of the Russian army. The first could only be ensured by a powerful squadron of battleships,

but the transport of the army and its subsequent operations required the presence of a number of cruisers and small vessels to act as convoy, cover and assist disembarkations, aid the army in its advance along the coast, watch and blockade the military ports of the enemy, and generally to push inshore into positions where it would be unwise to hazard the capital ships.

The war between Great Britain and the United States in 1812 was due to differences relative to the rights of neutrals. These differences arose during the wars of Napoleon, and disappeared with the downfall of that remarkable man. With no great political object at stake, the war was carried on in a desultory and half-hearted manner, and assumed the form of a maritime attack on trade, coupled with a series of ineffectual land raids on territory. In its broad features, the war was similar to the American Civil War of 1861-65. In either case a greatly superior navy established a close blockade of the hostile ports; but in 1812 the weaker side — the United States — owned a small navy, backed by a cloud of privateers, whereas in 1861 the Confederate States possessed neither navy nor privateers,—unless the *Alabama*, *Sumter*, and others be reckoned as such. It is the small American navy of 1812 which makes this war so instructive and in-

teresting, that its examination with some minuteness is necessary.

The United States declared war on 18th June 1812. On the 21st Commodore Rodgers put to sea from New York with the *President* and *United States* rated 44 guns, the *Congress* 38, the sloop *Hornet* 18, and the brig *Argus* 16. His object was to intercept a large convoy which had left Jamaica on May 20 for England. On the 23rd he sighted the *Belvidera* rated 32 guns, which was chased by the whole squadron. The *Belvidera* escaped by throwing overboard stores and starting water to lighten herself. After an interval the chase of the convoy was resumed, and continued until July 13, when, being within twenty hours' sail of the English Channel, and seeing no sign of it, the squadron altered course and reached Madeira on July 21. Rodgers then steered for the Azores and Grand Banks, and reached Boston on August 31. He had met and chased without success the *Statira* 38, and had taken only seven prizes during a cruise of seventy days, but indirectly his expedition had exercised a far-reaching influence.

The *Belvidera* reached Halifax on the 27th, but it was not until some days later that the admiral at that port received definite news of the declaration of war. On the 5th July the

British squadron sailed from Halifax under the celebrated Captain Broke of the *Shannon* rated 38, *Africa* 64, *Belvidera* 36, *Æolus* 32, and was joined off Nantucket on the 9th by the *Guerrière* 38. On the 14th the squadron was off Sandy Hook, and learnt that Rodgers' squadron was at sea. On the 16th the *Nautilus* 14 was captured, and on the following day the squadron chased the *Constitution* 44, which had left Chesapeake Bay on the 12th for New York. After a chase lasting upwards of two days the American frigate escaped, and not being able to enter New York, reached Boston on the 26th.

The uncertainty as to the movements of Rodgers' squadron not only forced Broke to keep his squadron concentrated, but made him anxious for the safety of a homeward-bound fleet of about sixty sail from Jamaica under convoy of the *Thetis* 38. He therefore met it on 29th July at a position some 500 miles from the coast of America, and accompanied it for a distance of about 500 miles. He left it on 6th August, detaching the *Guerrière* 38 to Halifax to refit, and proceeding with the remainder of the squadron towards New York, off which port he was reported on the 10th September. He had thus been absent from the American coast—the most important cruis-

ing ground—for more than six weeks. During this interval Rodgers' squadron had been able to re-enter Boston unmolested, and the American privateers had been free to attack British shipping.

On 2nd August the *Constitution*, Captain Hull, sailed from Boston in the hope of meeting the British frigate *Spartan* 38, reported to be to the eastward. Not meeting her, he stretched along the coast towards the Bay of Fundy, then proceeded off Halifax, and thence to the trade route off Cape Race, where he captured some prizes. Learning on the 15th that Broke's squadron was off the Grand Bank, and therefore not far off, Hull stood to the southward to avoid him, intending to go off the southern coast of the United States, but on the 19th met, captured, and burnt the *Guerrière*, and returned to Boston on August 30.

On October 8 Rodgers left Boston with the *President*, *United States*, *Congress*, and *Argus*, and on the third day out chased, but soon lost sight of, the *Nymphe* 38. On the following day, being outside the supposed line of the enemy's cruisers, and no longer fearing attack by superior force, the *United States* and *Argus* parted company with the squadron, and each proceeded to cruise separately. Fourteen days later the *United States* captured the *Macedonian*

38, and then returned to New London, where she arrived on December 4, her prize going into Newport and thence to New York by Long Island Sound. The *President* and *Congress* also nearly captured a British frigate—the *Galatea* 36—which was chased on October 31, but managed to escape during a dark night with the loss of a ship under her convoy. The two ships returned to Boston on the last day of the year, having captured nine prizes.

On October 26 the *Constitution* 44, Commodore Bainbridge, and *Hornet* 18 left Boston, intending to meet at a rendezvous in the South Atlantic the *Essex* 32, which left the Delaware two days later, but never joined. On December 29 the *Constitution* captured and destroyed the *Java* 38 off the coast of Brazil. The need for repairs then caused Bainbridge to return to Boston, where he arrived on February 27.

The *Chesapeake* 38 left Boston on December 17, and returned on April 18, having taken five prizes, been chased by a line-of-battle ship and a frigate, and chased a British sloop unsuccessfully for two days.

The general direction of the cruises made by the *President* and *Congress*, by the *United States* and *Chesapeake*, was to pass about 250 miles south of the Azores, and thence to the Cape Verd Islands, whence they stretched across to

the South American coast, and thence back to the United States, passing eastward of the West Indies. The intention was to intercept the trade to South America and round the Cape. It will be noted that in making for the centres where the trade routes crossed they were anticipating the movements of the *Alabama* fifty years later.

The proceedings of these frigates are very instructive. They show the risks run by an inferior force in the neighbourhood of a superior enemy. Two American frigates—the *Constitution* and *Chesapeake*—and four British frigates—the *Belvidera*, *Statira*, *Nymphe*, and *Galatea*—were nearly captured by squadrons, while three British frigates—the *Guerrière*, *Macedonian*, and *Java*—were actually taken in single action by the larger and more powerful American frigates of the *Constitution* 44 class. They afford proof that if one side concentrates the other must follow suit, unless it is prepared to see its important units picked up singly. Thus the concentration of Rodgers' squadron compelled the formation of Broke's. The heavy American frigate forced the British frigates to cruise in pairs, after which no British frigate was captured.

The lessons are equally applicable in the present day, since strategical principles are independent of the motive power.

Recent experience confirms this view. In the very instructive manœuvres of 1901 the same lesson was taught. Both sides properly concentrated their cruisers, which met and engaged off the Lizard soon after the commencement of hostilities. This method of using the cruisers was somewhat criticised at the time, but it was quite in accordance with war experience. It is true that the result of the action reduced greatly the number of scouts available, but the want of them was of no moment, as the two fleets, being equal in fighting power, could not do otherwise than seek each other, as they did. If the cruisers were to be eventually used to attack or defend the trade, each was best preparing to fulfil either *rôle* by destroying the enemy's ships of war. Again, during the Russo-Japanese War the Russian cruisers from Vladivostok, equally with the Japanese under Kamimura, were compelled to keep concentrated by the reciprocal and threatening action of the one on the other. But this concentration will usually be carried further, since it is a first principle in strategy to be as strong as possible at the decisive point. The armoured cruisers are now so large and powerful, and form so great a proportion of the available fighting strength, that both sides will be obliged to concentrate both battleships and armoured cruisers. If the con-

centrated squadrons are nearly equal in fighting power they will seek each other and fight, as occurred during the manœuvres of 1901. If they are not equal, and both remain in the same waters, they will meet sooner or later by accident, as occurred when the *Russia*, *Gromoboi*, and *Rurik* were intercepted by Admiral Kamimura, and the last-named ship was sunk. If the fight is to be avoided, the weaker force must either remain in port, or move into more distant waters as the Americans were driven to do during the war of 1812 by the overwhelming superiority of the British force on their coast. On the outbreak of the war this force was very small. Great Britain could not then concentrate a force any stronger than that of America, whose entire navy at the beginning of the war consisted of seven frigates, including two not available, one corvette, and eight small craft.

The British force on the North American and West Indian station was gradually increased, and on the under-mentioned dates approached—

	Sept. 1812.	Jan. 1813.	July 1813.
Ships of the line . .	4	7	14
Frigates	22	29	46
Small ships . . .	60	61	78

When the weaker force leaves the principal theatre of war and threatens other trade centres, it is an admission of inferiority, and an indica-

tion either that he can only hope for success by causing the stronger to disperse his forces—as was the object of Napoleon in sending Villeneuve to the West Indies in 1805; or that he renounces altogether the struggle for the command of the sea, and is content to confine his effort to an attack on trade, an altogether secondary object—as was the design and aim of the United States during the war of 1812.

The policy of dispersion adopted by the United States after the first three months of war acted reciprocally on the British, who sent detachments to St Helena, Madeira, and the Azores to cover the trade in those waters. The force employed on this service towards the close of the year amounted to seven sail of the line, twelve frigates and small vessels, and in addition to these numerous ships were employed on convoy service.

The strength of detachments is governed by the principle that superiority in fighting power at the main decisive points is maintained and assured, and that each detachment is at least equal to fighting any enemy which it is likely to meet. This was achieved by including one or two ships of the line in each of the more distant detachments,—a proceeding which would not have been possible if the United States had possessed a fleet of ships of the line, because

important units would then have been exposed to destruction in detail.

The system of meeting the attack by strong detachments and powerful convoys was supplemented by arrangements to blockade the frigates which when free threatened every weaker force. This was done, and after April 1813 the American frigates with difficulty got to sea. To prevent further captures of frigates by such of the powerful American 44's as might break the blockade, the British frigates, as before mentioned, were ordered to cruise in pairs, which proved to be a very effectual remedy.

The effect of the concentration of the frigates was that both sides made few captures of merchant ships. Up to April 1813 six American frigates captured, as far as can be ascertained, only forty-two prizes, although the total number of captures of British ships reported in the United States up to the end of September 1812 was 190, as against, for the same period, about seventy taken by the British ships of war, no letters of marque having as yet been issued. During the remaining two years of the war concentration was abandoned, and the American frigates cruised singly: three out of the seven were captured, and they only took thirty-six prizes, or a total of seventy-eight for the whole war, out of about 2500 taken—or 1750 if the

recaptures, according to Mr Adams, are omitted. Their want of success was due to small numbers, to difficulty in getting to sea past the blockading squadrons, to being driven out of the more frequented waters into distant seas, and to the convoy system which made it more difficult to pick up prizes.

The large number of captures made by the Americans was due to their small ships, and mostly to their privateers, which, at the outset of the war, issued from American ports in considerable numbers. During the first few months of the war any craft which could carry a gun and keep the sea was considered good enough. Many were armed with only one or two 9- or 12-pounder guns, and carried crews of eighty men or less. The multiplicity of these small ships, combined with their moderate individual value and importance, favoured dispersion, which is the true *rôle* of the small ship as against concentration for the capital ship. But the presence of British squadrons on the coast soon made themselves felt. While the American frigates were concentrated, and later on, when they were blockaded or driven away to distant seas, the British cruisers were free to deal with the American small craft. Twenty-four privateers were captured between July 1 and August 25, 1812. Four out of

eight United States sloops and brigs were captured during the first seven months. During the war about 250, or one-half the total number of American privateers, fell into British hands. This was the result of superior fighting power and not of superior speed. The pressure of the British cruisers was such that sloops and privateers of a special type were built at a cost of about one-fifth that of a frigate. They were fast enough to get away from a frigate except in heavy weather, and powerful enough to fight any ship of their own class. These vessels broke the blockade of the American ports with less difficulty than the frigates, and cruised in distant waters: they met with the greatest success in the British seas and West Indian waters, where the shipping was most numerous and was mostly unprotected by convoy. During the last eighteen months of the war upwards of one thousand merchant ships were captured, of which more than seven hundred were taken in seas remote from America.[1]

The war of 1812 showed that during the sailing era a small number of frigates was not a great danger to commerce, but that a large number of small craft was much to be

[1] For fuller details relating to the war of 1812, the reader is referred to Captain Mahan's 'Sea Power in its Relations to the War of 1812,' and to Mr Henry Adams' 'History of the United States,' vols. vi. and vii.

feared. The experience of the Russo-Japanese War was limited, but, so far as it went, teaches the same lessons in these days of steam. The Russian armoured cruisers made few captures, and Japanese trade was practically undisturbed, because those ships were few in number, and were forced not only to remain concentrated, but to limit their action to short raids. They were not able to operate on distant trade routes as did the American frigates. The Russian small ships were too few in numbers to be able to act with any effect; but the smaller Japanese cruisers, like the British small ships in 1812, enjoyed almost complete immunity, and were of great service. This immunity was not due to the possession of superior speed, but to the fighting powers of their capital ships, which were used as a menace, and held the enemy either blockaded or at a distance.

Given small ships in sufficient numbers, it is reasonable to infer from the history of the past that the necessary concentration of the armoured cruisers and capital ships will leave these small ships free to prey on the trade. British merchant ships have mostly less than 12 knots speed, and during any future war will be at the mercy of any moderately fast —say 15 knot—ships which can carry a gun

and keep the sea, if no steps are taken to meet them. Former Admiralties have recognised that the attack would be made at an early period of the war, and provided for it by placing ships to meet it. For instance, the South Atlantic squadron—now abolished—covered the large trade which passes Cape Verd from the Cape and South America. The new departure, under which many ships have been condemned, swept away "with one courageous stroke of the pen" a large proportion of the force available for the convoy service and protection of the trade, which will be certainly necessary in time of war.

The Russo-Japanese War has shown that neither the destroyer nor the torpedo-boat has introduced any change in general principles. These craft have a certain utility, but are not able to stand alone, and, like other small ships, need the support and protection of larger vessels. The Russian ships of this class shared the fate of their battleships: they were powerless to drive away the Japanese watching squadrons, to keep open the sea communications, or to prevent the disembarkation of troops on the coast of Manchuria and Korea. The value of these craft must remain an open question until more is known of the operations during the recent war. Care must be taken

to weigh well the whole of the facts before coming to any conclusion.

The general argument may now be shortly restated. During the early stages of a war, if the command of the sea is disputed, the battleships and armoured cruisers will be concentrated, and will be fully occupied in dealing with each other. During this time the small ships will be free, and will spread to operate on the communications—to attack and defend the trade. After the decisive action between the main fleets, if such be necessary, the winner will gradually dominate the seas forming the principal theatre of war, and will drive from it the hostile ships. His own small ships will be more or less free from attack, but those of the enemy will be exposed to attack by superior forces.

Apparently the German shipbuilding policy has been hitherto based on this view of war. Their main efforts have been concentrated on battleships, third-class cruisers, and destroyers. The armoured cruiser has been only sparingly developed. The battleship is intended to fight the decisive action, while the small cruiser will be free to attack the sea communications. The destroyer and torpedo-boat are the unknown quantities which, it is hoped, will assist the battleship in the narrow waters of the North Sea.

Looked at in the light of these views, the hasty withdrawal of so many cruisers and small ships from foreign stations seems to have been founded upon a misapprehension of the nature of war, and of the wants and requirements of the British Empire. It is a mistake to suppose that, because a ship is small and of moderate speed, therefore she is of no military value. A small ship inside the bar at Taku during the Pekin Expedition was of more value on the night the forts were taken than the battleship outside the bar, fifteen miles away. The Japanese small ships, which pushed in to shoal waters to support the attack at Nanshan, were of priceless service. The true *raison d'être* of the small ship is that it is economical and helps concentration. The South African War affords a good example of its use. A considerable number of ships were required on the station to stop the supply of arms and for other services. The demand was met by transferring small ships from other stations. Had these ships not been available, it would have been necessary to send larger ships. This would have weakened the British Fleet in European waters at a time when the political situation required that force to be strong. If similar demands were made at the present time they could not be met in the same way,

because upwards of thirty cruisers and smaller vessels have been withdrawn from foreign stations. Some reduction may have been advisable, but that it was overdone is proved by the fact that it was found necessary to replace some of the ships withdrawn.

VI.

THE STUDY OF TACTICS.[1]

NAVAL tactics, which deal with the movements of hostile ships and squadrons when in presence of each other, are a changing art dependent upon qualities inherent in human nature and on the weapons employed in battle. The human element is important, because the ultimate aim in battle is to destroy the mental equilibrium of the enemy. The fundamental principles seem to be chiefly determined by the power and limitations of the weapons in use, and to be little influenced by the mechanical arrangements for moving the ships.

In classic times the motive power was the oar, and the principal weapons were the ram and the sword. The ram in the hands of the skilled Greeks was effective against the unpractised Persians, and for a time dominated tactics; but being found too uncertain and hazardous against an equally skilled foe, was given

[1] Brassey's Annual, 1905.

up in favour of the sword. Ships were manœuvred to board rather than to ram. It was the failure of the ram as a weapon, and not any change in the motive power, which produced the change in tactics at that time. Although afterwards revived from time to time, and successful in skilled hands, the ram was never able to maintain itself against the sword and missile weapon throughout the galley period. In the sailing-ships of this period the same weapons were used as in the galleys. The object of their commanders was to board, as is proved by the accounts of the actions fought by the sailing fleets of England during the fourteenth century. Thus boarding tactics were common to the rowing and sailing navies so long as the sword was the chief weapon, and no important departure from them seems to have been introduced into the sailing fleets until the gun was developed. It was the great increase in gun power rather than the development of the sailing-ship, which led the Elizabethan seamen to adopt tactics suitable to fighting at a distance rather than hand to hand. The fact is that changes in the motive power only affect the times required to move from one position to another. They do not influence the tactical formations to be adopted, which must be those best suited to the effective use of the particular weapon employed.

That tactics are governed by the weapons in use rather than by the motive power can be shown by tracing the movement of naval opinion during the steam era — that is to say, since the Crimean War, which saw the abolition of the sailing-ship and ushered in the armoured ship propelled by steam. At that time the naval mind was dominated by the single idea of the close-hauled line ahead as a battle formation. Half a century of peace had diverted thought from war, and it is very doubtful whether the great body of the Navy had any clear idea of the great principles underlying the tactics of the sailing fleets. In Great Britain the value of the line ahead was questioned by Sir Howard Douglas, a distinguished artillery officer, who in 1858, generalising from his knowledge of artillery and fortification, proposed other formations which seemed to him to be more favourable for the use of the gun.

It was not until 1865 that the question was taken up by the late Vice-Admiral P. H. Colomb, who had been employed in connection with the alterations in the Signal-Book made necessary by the experiments carried out by Sir William Martin in the Mediterranean fleet. In that year Colomb called attention[1] to the

[1] Paper read at R.U.S. Institution, 28th February 1865—"Modern Naval Tactics."

weakness of the line ahead placed broadside on to meet an attack by rams. He based his argument on the decreased efficiency of the gun, but without supporting this by experimental data, although he was careful to say that "experiment only can solve most of the questions" involved.

In the following year (1866) the battle of Lissa was fought, and, as is well known, the Italian single line ahead was opposed to the Austrian double quarter line. The former depended upon the gun, and the latter on the ram. The Italian line was very badly formed, and the Austrian squadron passed through a large gap without any loss to either side. In the general *mêlée* which ensued one of the Italian ironclads was sunk, and naval opinion at once accepted the conclusion that the ram was more formidable than the gun, and that the line ahead was no longer suitable. It was not seen that the facts were altogether inconclusive; that the Austrians were not opposed to a well-formed line; that the *Re' d'Italia* was sunk because she happened by accident to be stopped right across the path of the *Ferdinand Max;* that the *Palestro* was destroyed by gunfire.

Colomb read a paper[1] on the battle in 1867,

[1] "Lessons from Lissa." Read at R.U.S. Institution, 29th April 1867.

and stated the problem to be solved thus: "Can you, with a fleet of *Bellerophons* (the typical ship of those days), and the most highly trained gunners, being in the position of the Italian fleet, stop another fleet of *Bellerophons* coming down upon you in the position and with the intentions of the Austrian fleet, by means of your artillery-fire?" He asked for experiments to test the accuracy of artillery-fire under such conditions. The necessity for experiments to determine the accuracy of the ram does not seem to have been appreciated at the time. For many years no experiments of any sort were carried out, and no attempt was made to determine whether the line ahead was as weak as was supposed, but all navies proceeded to build rams. As we now know, the arguments in support of them were based on quite inconclusive data.

It was not until 1871 that Colomb returned to the subject,[1] to which he applied the more rigorous inductive method in lieu of the loose arguments which he had before used. His plan was to investigate closely the capabilities of the weapons — the gun, the ram, the torpedo—and then to apply the conclusions to actions, first between single ships and after-

[1] "The Attack and Defence of Fleets." Read before R.U.S. Institution, 3rd April 1871 and 15th January 1872.

wards between fleets. The naval service is immensely indebted to him for starting on sound lines a discussion which, after many years, has borne good fruit. He was met at the outset with the complete absence of reliable experimental data, and was obliged to use such as were available. It is not surprising that his arguments from unreliable data led to conclusions which were afterwards found to require revision.

The experimental data required to determine the accuracy and efficiency of the ram as a weapon are correct facts relative to the path of a ship when turning under helm. In 1871 Colomb, in the absence of experiment, assumed that the path was circular; but he was fully aware that his data were imperfect, and was careful to limit himself to the opinion that his conclusions probably only approached the truth. His main deduction was that ramming was not a difficult task, and by superior skill could be effected with vessels otherwise equal. A ram whose turning powers were much greater than her adversary's might attack with every prospect of success. It was not until 1877 that the turning trials of H.M.S. *Thunderer* gave the correct facts, and proved that the path was not circular. They were followed from time to time by other trials, but the full value and meaning of the facts placed at their

disposal were not completely realised by the naval service as a body until the loss of the *Victoria* in 1893, when the Admiralty ordered the captains of ships to make more complete trials than had hitherto been made.

The efficiency of the gun as a weapon depends upon the number of hits which can be made in a given time by a ship at sea firing at another ship, and upon the effect produced by each hit. The latter has been repeatedly tested on the practice ground, with results largely misleading, since the *matériel* alone has been tried. No experimental data in any way reliable existed in 1871 to determine the former. Colomb pointed out the necessity of obtaining this information in 1867 and again in 1871, and since then other writers have called attention to the same point; but, strange as it may appear, no reliable experiments were carried out until more than a generation after the necessity for them had been pointed out.

From the imperfect data at his disposal, Colomb came to the conclusion that only about 10 per cent of the shot fired from a sea-going ship of the *Monarch* type would take effect upon another such ship broadside on, at a fixed distance of 1000 yards, and that the highest rate of fire which could be calculated on was one round in three minutes. The damage done

was not easy to estimate, but except at close quarters was held to be small, and when received end on was considered to be *nil.* The broad result was that the ram was held to be superior as a weapon to the gun. Arguing on this as a basis, he held that the end-on position would be assumed by hostile ships and fleets; that, although the ram was the chief weapon and would dominate and prescribe the formation, it would not be used in fleet actions, because the ship attacked would be covered by the ship next to her in the line; that, as the broadside gun would be used in default of the ram, line abreast would be inadmissible, and that consequently fleets would approach each other and engage in single line ahead. This view would appear to have been accepted by the Service, and to have been held for upwards of twenty years, as it was practised by Sir G. Tryon in the Mediterranean fleet in 1892, and presumably represented his intentions at that time. Although not remarked at the time, the influence of the ram had turned the line of battle through a right angle.

These papers of Colomb's have been dwelt upon at length because they indicated the only safe method of attacking the problem, and because their influence on opinion remained until the same method was applied with closer reason-

ing and the advantage of more accurate experimental data by the late lamented Rear-Admiral H. J. May in two remarkable papers [1] in 1897.

During the interval of twenty-six years which had elapsed since the papers read by Colomb, sufficient data had been accumulated, mainly through his persistent efforts, to enable May to prove that, even with the highest skill and best possible ship, ramming must always be a most hazardous undertaking. Thus upwards of thirty years after the battle of Lissa the ram was shown to be unreliable. We have come to the same conclusion, and probably for the same reason, as the Greeks, who upwards of 2000 years ago gave up the uncertain ram for the—at that time—more reliable hand-to-hand fight.

In 1897 sufficient experimental data did not exist to fix the powers and limitations either of the Whitehead torpedo or of the gun. May assumed the effective range of the former to be 600 yards, which is certainly within the limit at the present time. Extended and careful experiments at sea are required to determine the accuracy. Such experiments as have been carried out are believed to show that the difficulty of hitting with it, even much within fighting ranges, has been underestimated.

[1] "Notes on Tactics for Ships and Weapons of the Present Day." —R.U.S. Journal, xli. 48, 201.

The outside effective range of the gun was assumed to be 3000 yards, or 5000 yards when chasing. We know now that these distances may be much increased, and that any ship which attempts to push inside of 4000 yards of a battleship's broadside, properly served, without first silencing some of her guns, must expect to suffer serious damage and loss. This is an additional reason for discarding the ram, and also indicates that the Whitehead torpedo cannot be counted on until its effective range and accuracy have been largely increased, and proved by experiments at sea to have been so. The gun alone remains as the weapon to be relied upon in action. The question put by Colomb in 1867 has at last been answered. Reliable experiments have shown that a squadron in line ahead, with its gun-fire, can stop a similar squadron approaching in line abreast from the beam bearing or thereabouts. It is true that May rightly held this view in 1897, but it was only opinion, and was unsupported by fact previous to the experiments carried out in the Mediterranean in 1904, and the experience of the Russo-Japanese War.

The underestimate of the power of the gun, due to the want of experiment at the time May wrote, led him to attach undue value to speed. He claimed that it gave choice of weapons, but

this cannot be so, as there is only one weapon —the gun. His arguments killed the ram, and such experiments as have been carried out since he wrote have tended to destroy the Whitehead as a weapon for use by battleships. Again, the claim that it gives choice of range is only true to a limited extent. The enemy's broadside fire has to be reckoned with, and may compel a turn away, thus fixing the minimum range. Whether speed gives any tactical advantage beyond the power to accept or refuse action is still a very doubtful question, and will remain so until the question is properly investigated and tested by experiments.

If the gun is the chief and only reliable weapon of the modern fleet, as it was formerly of the sailing fleet, and if the weapon governs tactics, it may be that the principles involved are the same whether the ships be propelled by sails or by steam. What were the principles underlying the tactics of Monk and De Ruyter, of De Suffren and Nelson? History alone can answer. The works of Hoste, De Morogues, and Clerk of Eldin must be studied. We must critically examine not only the accounts of the battles at sea fought during the sailing era, but also the old Fighting Instructions under which the admirals acted. These Instructions, which originated during the Dutch wars, and show the gradual evolution of naval

opinion during two centuries, are of extreme importance, and have been printed for the Navy Records Society under the able editorship of Mr Julian Corbett. His work merits the close attention of all those, whether professional or otherwise, who are interested in sea power. It furnishes an additional proof, if such were needed, of the value of that Society, and shows indirectly the wisdom of the late Board of Admiralty, who, in the year 1900, inaugurated the study of war at the Greenwich College, and thus encouraged thought and research both inside and outside the naval profession.

The principles underlying the tactics of the sailing fleets were quite simple. As set forth by Hoste, De Morogues, Clerk of Eldin, and practised by De Ruyter and Monk, by Torrington and De Tourville, by De Suffren, Rodney, and Nelson, they may be summarised thus:—

1. A fleet should be so disposed on going into action that no part can be attacked without being supported by the remainder within a *reasonable* time.
2. A fleet should be taken into action in such a way as to bring a great superiority to bear on a part of the enemy before that part can be supported by the remainder.

These principles are best explained by reference to battles in which they have been applied. The two most instructive instances are the battles of Cape St Vincent (14th February 1797) and Trafalgar (21st October 1805). The leading features of the former are well known. The wind on that day was W. by S. The Spanish weather division of twenty-one ships was steering E.S.E. to rejoin their lee division of five or six ships, which were some way to leeward, and standing close-hauled on the port tack. The British fleet of fifteen ships, in a closely-formed single line on the starboard tack, passed through the gap, obliging the greater part of the Spanish weather division to haul up to N. by E. It is evident that if the whole of the British ships had stood on and tacked in succession, the Spanish weather division would have passed astern and rejoined the division to leeward. It is Nelson's great merit that he saw the importance of preventing this, and frustrated it by wearing and standing across the track of the Spanish weather division to head them off. Sir John Jervis took his fleet into action in a single close-hauled line, so that his ships could mutually support each other without delay, whereas the Spanish force was so disposed that the weather division was exposed to attack without a possibility of support from the ships to leeward within a reasonable

time. The Spanish fleet may be considered to have been ranged parallel to the line of the wind, whereas the British line was six points from it. The two lines were nearly at right angles to each other, and the British attack divided the Spanish fleet. The disposition of the British fleet was correct in principle, whereas that of the Spanish was entirely incorrect, in that the ships to leeward were in the worst possible position for supporting those to windward.

The practice of ranging a fleet in single line ahead on either of the two lines of bearing, each of which made an angle of six points with the wind, originated during the Dutch wars of the seventeenth century, and was fully explained by Hoste in his *Treatise on Tactics* published in 1697. The single line ahead was adopted because it gave a clear field of fire to the principal weapon —the guns mounted on the broadside—and was best adapted to keep station and to give mutual support, as each ship moved up automatically. The lines were kept close to the wind because on those lines the fleets were more nearly on an equality than on any other, and because each tried usually to get into a position to windward, which was held to confer some advantages. Thus the direction of the line in a sailing fleet, being dependent upon the wind, was fixed; and as the two fleets were usually ranged in parallel

lines, it came about that each was drawn up nearly at right angles to the bearing of the other. The arguments in favour of the single-line-ahead formation are equally applicable to modern fleets, as their broadside is superior to their end in fire; but the direction of the line in a steam fleet, not being dependent on the wind, is determined by the necessity of ensuring that all the broadside guns will bear when the ships are turned up to engage, which means that the line must be maintained nearly at right angles to the bearing of the enemy. The conclusion is the same whether the fleet be moved by sail or by steam. The capabilities for defence of a single line so formed were shown by the repeated failure of our attempts during the eighteenth century to bear down and attack a fleet ranged in single line to leeward.

Nelson's proposed plan of attack previous to Trafalgar, as explained in his Memorandum dated 9th October 1805, provided for an attack either from the leeward or from the windward. The two attacks were identical in principle: each was to be directed against the enemy's rear, while the interference of his van was prevented. In method the essential difference was, that the attack from the leeward directed each division to cut through the enemy's line in line ahead, while that from the windward

ordered the ships to break through in line abreast. The attack from the windward assumed the enemy to be on a wind, and ranged in one line to leeward, and the British fleet to be in three columns nearly within gun-shot to windward of the enemy's centre. The sixteen ships of the lee British column, under the Second-in-Command, were to bear up together and attack the twelve rear ships of the enemy. The remaining two columns, under the personal control of the Commander-in-Chief, were to prevent the van and centre of the enemy interfering with the movements of the Second-in-Command. In other words, the van of the enemy was to be "contained"—that is, prevented going to the assistance of their rear, which was to be overwhelmed by a superior force. As is well known, the actual attack was not carried out exactly as arranged in the Memorandum; but the principle was adhered to, in that Nelson did go into action in such a manner as to cover Collingwood from interference by the Franco-Spanish van. The importance of thinking out principles is shown by the fact that the plan, being correct in principle, was still applicable, although the execution differed in detail from the forecast.

It will be noted that much depends upon the time given to bring up supports to the assistance of the ship attacked. This interval is measured

by the time required to silence or beat a ship in close action, which is apparently as short now as it was in the past, seeing that the *Shannon* beat the *Chesapeake* in eleven minutes, and the *Varyag* was silenced in fourteen minutes. At St Vincent and Trafalgar the speed was about three knots, and in those days long range may have been something less than 2000 yards and close action 200 yards or less. If ships can only be moved in any particular direction one mile in twenty minutes with a fair wind, or at most one-third of that distance with a foul wind, and are to mutually support each other, it is not difficult to understand the importance which our forefathers attached to keeping them in line on a wind well closed up. At the present time the speed in action may, at a moderate estimate, be taken as twelve knots as against three; and steam-ships command a much greater variation of speed than sailing-ships. On the other hand, distances are greater. Higher speeds may be to some extent balanced by longer distances to be traversed. Long range may now be 8000 yards and close action anything within 4000 yards, so that ships can help and sustain each other by their fire from longer ranges, especially if the guns are given large arcs of fire. While, therefore, concentration on a part of the enemy is still the main object, and the line ahead is still the

best formation for bringing the guns into action and for mutual support, it may be permissible within limits to open out the interval between the divisions for a special tactical purpose.

Instances can be cited of attempts to gain a tactical advantage either by dividing the enemy or by concentrating on his van, on his centre, or on his rear. The different methods of making these attacks have been fully discussed by Hoste, De Morogues, and Clerk of Eldin, whose works are still instructive, and deserving of close study.

The practice of dividing the enemy was frequently used during the Dutch wars of the seventeenth century, but without any particular method; and it does not seem to have met with any marked success. Hoste, the mouthpiece of De Tourville, and De Morogues following him, were against it, but Clerk was for it, and Nelson adopted his plan. Rodney at Dominica and Jervis at St Vincent are the two most successful examples. Opportunities to put it into practice may again offer, but the power of free movement which ships now possess seems to make it easy to double on any hostile ships which interpose between the parts of a fleet.

Concentration on the van of a fleet under weigh was not much practised during the sailing era, and then never met with much success. It was Nelson's plan of attack when his squadron

was a small one. The best-known instance is the attack of Monk on the van of De Ruyter in the action on 1st June of 1666. In this battle the inferior English fleet was to windward, and bore down on the Dutch van with the intention of crushing it before it could be supported by the centre and rear, which were some way to leeward. The attack failed, and when the ships engaged tacked they found that they had fetched so far to leeward during the engagement that the Dutch centre and rear weathered on them, brought them to action, and inflicted much damage. This is a typical example of the objection raised by Hoste to an attack on the van. The ships in the rear automatically came up to help and cover their own ships, and to attack those of the enemy which may have lost ground from any cause during the action. The objection is quite independent of the motive power, and is valid whether the ships be moved by sail or by steam. The argument in favour of attacking the van was, that if the leading ships were disabled the enemy's line would be thrown into disorder; but this was not admitted by Hoste, and does not seem to have appealed to the seamen of those days. Writing nearly a century later, Clerk of Eldin showed, from the actions of Byng, Arbuthnot, and Graves, that when the attack was made

on the van the attacking fleet, while closing, suffered more than the defending fleet waiting to leeward.

The battle of Providien on the 12th April 1782 is an example of an attack on the centre. De Suffren, in this case taking advantage of the British rear being astern and to leeward, concentrated on their centre, while containing their van. Had the rear been in proper station, he would no doubt have concentrated on the rear, as he did both in earlier and later actions. This action is quoted to show the necessity, on the one hand, of being ready to adapt a plan to circumstances, and, on the other, of keeping ships in station and well closed up.

Concentration on the rear is free from the objection raised to an attack on the van, and was usually coupled with an attempt to "contain" the van. It seems to have originated during the Dutch wars, and to have been included in the 1673 Fighting Instructions, but afterwards omitted. De Ruyter appears to have attempted to apply the principle at the battle off the Texel in August 1673. Torrington used it successfully at Beachy Head in 1690, and De Tourville at La Hogue in 1692. Both Hoste and De Morogues recommended it. Rodney, who had lived in France for some time, and may have been abreast of the French naval opinion, tried to

attack the rear on 17th April 1780. He was foiled by De Guichen, who wore immediately, forcing him to haul to the wind on the same tack, and thus showed the correct way to meet such an attack. De Suffren, in his order of 14th June 1783, arranged to double on Hughes' rear, with part of his force, while his remaining ships contained the British centre and van. But the classical instance is Trafalgar, already quoted. The principle was due to Clerk of Eldin, but the plan and execution were the product of Nelson's genius and insight. No stronger example could be given of the immense importance of studying tactics, but for practising them in time of peace an equally strong instance can be quoted.

Mention has already been made of the actions of Byng in 1756, of Graves and Arbuthnot in 1781, in each of which the French assumed the position to leeward and awaited attack. As De Morogues' book, published in 1763, contains instructions for conducting a sham fight under the conditions which prevailed in Byng's action, it is extremely probable that their squadrons were practised in rehearsing that action. If that was the case, French officers would have fully understood what to expect from such attacks as those of Arbuthnot and Graves, and must have been well prepared to meet them.

The very contrary was the case during the war of the French Revolution, when their Navy had cause to lament the want of tactical training of their officers.

The tactical exercises which have been carried out of late years by modern navies are thus not a new idea. The annual manœuvres previous to 1900, with the exception of those carried out in 1891, did not teach any tactical lessons, because they were subject to fixed rules for engaging, which completely fettered the hands of the officers in command, and inculcated the pernicious idea that mere numbers and size, as opposed to skill, must win. Under the spirit of those rules Admiral Togo should have avoided action with the Russian fleet on the 10th August 1905. In the year 1900 the Board of Admiralty caused the rules to be entirely altered. Officers in command were left entirely free to act as they would in time of war, subject, of course, to the proviso that the ships should not be hazarded. The change was momentous, but was not understood at the time. The effect was not fully realised until the following year, when Sir A. Wilson and Sir G. Noel, taking full advantage of the new conditions, met off the Lizard and initiated a great departure in the teaching of tactics. Since that date some progress has been made, but much remains to be done.

The solution of the tactical problem depends upon the twin sisters—historic truth and experimental fact. Research has not yet placed at our disposal sufficient historical material, but the harvest is being rapidly garnered. Experiments have given us some facts, but many more are required. The time is not yet quite ripe for a full discussion, but this sketch may perhaps serve to incite the labourers in the field to fresh exertions by showing the practical and living importance of the work. It has been written with the object of showing that tactical principles are dependent upon the weapons in use and not on the motive power; that changes in tactics are due to changes in weapons, which can be largely determined by careful experiments in time of peace; that history has as many lessons to teach in tactics as it is admitted to have in strategy; that both study and practice are necessary, and promise to lead to as much success in the future as they invariably have in the past. It has not been possible in the limited space to show the influence of tactics on construction, but it would not have been difficult to prove that they exercise a dominating ascendancy, and that the expenditure of large sums of money must depend upon the correct solution of tactical questions.

VII.

THE BATTLE OF TSU SIMA.[1]

BATTLES are lost and won by men, and not by ships. Ships are not themselves the weapons with which battles are decided, but are the instruments of war used by men to carry the weapons—the guns.

Motion is given to ships in order that

(1) The weapons may be used to the best advantage. This is its tactical side.

(2) Fighting power may be transferred from one position to another. This is its strategical side.

We are now concerned with the tactical aspect only.

The advantage which one fleet gains over another in using its weapons depends upon their respective formations as well as upon the

[1] Blackwood's Magazine, February 1906.

movement of the one relatively to the other. This relative movement varies less with the absolute magnitudes of the motions — the speeds—than with their directions—the courses. It is proposed to illustrate these propositions by the recent battles in the Japan seas.

If the cruisers and other ships not in the line of battle are neglected as being outside the question under discussion, the forces engaged at the battle of Tsu Sima on the 27th May 1905 were as shown below.

RUSSIAN FLEET.

	Displacement. Tons.	Nominal Speed. Knots.	Gun Armaments.
First Division.			
Souvaroff[1], Borodino, Alexander III., Orel	13,516	18	4 12-in., 12 6-in.
Second Division.			
Oslyabya[2]	12,674	18	4 10-in., 11 6-in.
Navarin	10,206	16	4 12-in., 8 6-in.
Sissoi	10,400	16	4 12-in., 6 6-in.
Nakhimoff	8,524	17	8 6-in., 10 4·7-in.
Third Division.			
Nicholas I.[3]	9,672	15	2 12-in., 12 6-in.
Apraxin	4,126	16	3 10-in., 4 4·7-in.
Senyavin, Otchakov	4,700	16	4 10-in., 4 4·7-in.

[1] Flag of Vice-Admiral Rojdesvenski.
[2] Flag of Rear-Admiral Folkersahm.
[3] Flag of Rear-Admiral Nebogatof.

JAPANESE FLEET.

	Displacement.	Nominal Speed.	Gun Armaments.
Main or Battleship Division.	Tons.	Knots.	
Mikasa[1] .	14,500	18·0	4 12-in., 14 6-in.
Shikishima .	14,850		" "
Fuji . .	12,450		4 12-in., 10 6-in.
Asahi . .	15,200		4 12-in., 14 6-in.
Kasuga, Nisshin[2] .	7,294	20	1 10-in., 2 8-in., 14 6-in.; 4 8-in., 14 6-in.
Armoured Cruiser Division.			
Idzumo[3] .	9,750	20·7	4 8-in., 14 6-in.
Adzuma .	9,400	20	4 8-in., 12 6-in.
Asama . .	9,700	21·5	4 8-in., 14 6-in.
Tokiwa . .	9,700	21·5	4 8-in., 14 6-in.
Yakumo .	9,850	20	4 8-in., 12 6-in.
Iwate . .	9,750	20·7	4 8-in., 14 6-in.

N.B.—It is uncertain whether five or six armoured cruisers were present during the early stages of the battle, and there is some doubt about the armaments of *Nakhimoff* and *Nicholas I.*

The broadside of the respective fleets consisted of:—

Guns.	Japanese.		Russian.	
12-in. . . .	16	17	26	41
10-in. . . .	1		15	
8-in. . . .	30	110		...
6-in. . . .	80		48	59
4·7-in. . . .	...		11	
	127		100	

The Russians had more than double the number of large guns, 12- and 10-in., whereas the Japanese used nearly twice the number of the smaller natures.

[1] Flag of Vice-Admiral Togo. [2] Flag of Rear-Admiral Misu.
[3] Flag of Vice-Admiral Kamimura.

The nominal speed of each division was that of its slowest ship. For the Russian first division this was 18 knots, for the second 16 knots, and for the third 15 knots. These nominal speeds must be largely discounted in practice. If the sea speed is taken to be five-sixths the nominal, the available speed would have been for the first division 15 knots, for the second 13¼ knots, and for the third 12½ knots. Before the main fleets sighted each other the speed of the Russians was reported to Admiral Togo as about 12 knots. If this speed was maintained during the action, until the ships were crippled by the Japanese gun-fire, the respective divisions would have had in hand for station-keeping and manœuvring purposes reserves of speed not less than 3 knots, 1¼ knots, and ½ knot.

The nominal speed of the Japanese battleship division was 18 knots and that of the armoured cruiser division 20 knots. If the sea speeds are taken to be five-sixths of these, as in the case of the Russians, the available speeds would have been 15 and 17 knots respectively. If the speed of the Japanese fleet when the action began was 14½ knots, the battleships would have had not less than half a knot in hand for station-keeping and the armoured cruisers not less than 2½ knots.

In considering tactical problems, it is essential

to know the angles or bearings within which the fire of the guns can be directed. The information on the point is not entirely reliable, but the following assumptions, which approach the truth, will be made. The term "right abeam" means a line perpendicular to the fore and aft line of the ship.

The whole broadside of the *Souvaroff* class could only be directed on objects within angles of 45 degrees from right abeam. Before (or abaft) that extreme bearing the after (or fore) 12-inch guns would go out of action. The 6-inch guns would all continue in action up to perhaps 45 degrees from right abeam, beyond which two would go out of action. The ships composing the Russian second division could each bring the whole broadside to bear on an enemy within only about 40 degrees of right abeam, and those of the third division within about 30 degrees.

The Japanese battleships and armoured cruisers could each concentrate the whole broadside on an enemy within about 30 degrees of right abeam. Before (or abaft) that extreme angle the after (or fore) turret and, in the *Mikasa* only, the after (or fore) upper 6-inch guns would go out of action. The Russians held an advantage in being able to train their guns through larger arcs.

A full and accurate account of what actually

occurred at the battle of Tsu Sima will probably never be written. Both Japanese and Russians were fully occupied in fighting. Neither side was able to take the accurate observations required to make a reliable plan. We are therefore under the necessity of analysing the facts given in Admiral Togo's report with a view to determine the assumptions which must be made to complete the picture.

Togo says that at noon he was ten nautical miles north of Okino Sima with the battleship division, the armoured cruiser division, and other ships with which we are not concerned. At this time he knew that the enemy were to the south-westward of him, and that they were in two columns, steering north-east at a speed of about 12 knots. He himself now steered west, with the object of attacking the enemy's left column. He does not give either his own speed or the formation of his fleet. There is reason to believe that both the Japanese divisions were formed in single line ahead, but acted to some extent independently of each other. Their speed will be assumed to be $14\frac{1}{2}$ knots.

At 1.45 P.M. Togo, still steering west, sighted the Russian fleet on his port bow at a distance of several miles. He tells us that at 1.55 P.M. he made a particular signal, and "shortly afterwards the main or battleship division headed

south-west so as to make the enemy believe that it meant to pass them in an opposite direction. At 2.5 P.M. the main division suddenly turned east, and thus changing its front, pressed obliquely on the head of the enemy. The armoured cruiser division followed in rear of the main division, the whole forming single column in line ahead." These turns were undoubtedly made in succession, although not so stated (see Diagram III., p. 188). When shall I make these turns? must have been the question occupying the mind of the Japanese admiral at this time. The answer depended upon the bearing and distance from the *Oslyabya*, the leader of the Russian left column, at which he wished to find himself when the *Mikasa*, his flagship, had completed her turn to east. As that ship began to turn at 2.5 P.M., this must have been at about 2.8 P.M. when the Russians opened fire at a range which is not known. Togo says: "We bore the fire for a while, and on reaching a range of 6000 metres (say 6500 yards) we concentrated a fierce fire on the two ships at the head of the enemy's lines."

The problem may briefly be stated thus: The Russians, steaming north-east at a speed of 12 knots, open fire at 2.8 P.M. on the Japanese, the range and bearing being unknown to us. These last are steering east at a speed of 14½

knots, and after an interval, not stated, open fire at a range of 6500 yards. What was the probable range and bearing at 2.8 P.M.?

Two diagrams have been prepared to aid the solution. Diagram I. (p. 188) assumes that the bearing of the *Oslyabya* was S. 35° E. from the *Mikasa*, and shows that it would have remained constant, and the two ships would have actually collided had the courses and speeds been maintained. This would have been a bearing unfavourable to the Japanese, who would have had the Russians 35 degrees before their beam, and their after guns would have been out of bearing, whereas the Russians would have had the Japanese only 10 degrees before their beam, and all their guns not masked by other ships would have been in action. In order that all their guns might bear, it was important for the Japanese to keep the Russians less than 30 degrees before the beam. The Japanese must have wished to turn east earlier than this assumption supposes, as otherwise on that course they could not pass ahead of the Russians, they would expose their van to be pressed on obliquely, and they would be liable to have their own tactics turned against themselves.

Diagram II. (p. 188) assumes the initial bearing of the *Oslyabya* from the *Mikasa* to have been S., and shows that if the range at 2.8 P.M. had been

10,000 yards it would not have been reduced to 6500 yards until 2.23 P.M. The Japanese would have had to endure the Russian fire for fifteen minutes without reply, and on opening would have had the *Oslyabya* 28 degrees abaft their beam. This is rejected as improbable. If the initial range had been 8000 yards, the Japanese would have been exposed to fire without reply during six minutes, or until 2.14 P.M. The *Oslyabya* would then have been 11 degrees abaft the *Mikasa's* beam, and the *Mikasa* 56 degrees before the beam of the *Oslyabya*. This assumes the Russians to continue to steer north-east, whereas Admiral Togo says they altered course to starboard. They did this probably with the object of bringing their guns to bear. The effect would be to greatly increase the interval beyond six minutes. Again, on this assumption the fire of the Russian first division would not be well masked by the second, which is presumably what Togo wished. The initial bearing is believed to lie between S. and S. 35° E. We shall assume that at 2.8 P.M. the *Oslyabya* bore from the *Mikasa* S. 18° E., and that the range at that time was 8000 yards.

From these initial data and the facts in Togo's report, we are now in a position to construct Diagram III., working backwards and forwards from the positions at 2.8 P.M.

The precise formation of the Russian fleet is

doubtful. According to Togo, they were in two columns in line ahead, the first division being in the starboard and the second in the port column. The position of the third division is not certain, but it is believed to have been in the starboard column, four cables (800 yards) astern of the first. It will be assumed to have been there. The distance between the columns and between the ships of each division is also uncertain. The columns will be assumed to have been eight cables (1600 yards) apart, which accords with the official report of General Linievitch dated June 10, and based on the reports of the survivors who arrived at Vladivostok. The distance between the ships will be taken to have been two cables (400 yards), the usual distance.

Diagram III., thus constructed, shows the position of each fleet at 1.45 P.M., when Togo first sighted the enemy, also those of the column leaders at five-minute intervals after that time. The result of plotting the tracks to scale is to place the *Oslyabya* at 1.45 P.M. about S. 35° W., $10\frac{1}{3}$ miles from the *Mikasa*. This result is so contrary to what we have been led to believe, that it is necessary to compare it carefully with the official statements. Togo says in the report issued on June 14: "At 1.45 P.M. I first sighted the enemy at a distance of several miles south

on our port bow." This leaves in doubt the distance at this time. In an earlier part of the same report he says: "In spite of the thick mist, which confined the view within five nautical miles, the information thus received enabled me at a distance of several tens of miles to picture myself . . ." He is speaking of the weather some hours before the battle, and not at 1.45 P.M. An examination of Diagram III. shows that the fleets could not possibly have been only five miles apart when they first sighted each other. That distance is quite inconsistent with the subsequent movements described by Togo. We are inclined to believe that the weather must have varied during the day, as is often the case, and we are confirmed in that view by Togo's first report on the morning of the battle, which says, "weather is fine and clear but the sea is high." Again, the seventh report received at Tokyo on May 31 reads: "In the present battle, which was fought with almost the entire strength of fleet on both sides, not only was the field of operations extremely extensive, but the weather was very misty, so that even where there was no smoke from guns or funnels the vision could not reach beyond 5 *ri*" (10½ nautical miles). This is not quite conclusive, as it is not certain that he refers to the weather at 1.45 P.M. But as the diagram is confirmed in a singularly inde-

pendent way, we may take it as correct until stronger evidence is forthcoming to prove otherwise. The *Mikasa* is assumed to have made the first turn at 1.58 P.M., or three minutes after Togo hoisted the signal before mentioned. A minute or two sooner or later would have made no material difference. The distance was then about 13,600 yards, and at 2.5 P.M., when the *Mikasa* put her helm down to steer east, was only 9400 yards. During this interval the rate of approach was 600 yards a minute.

The Russians opened fire at 2.8 P.M., when the range was 8000 yards. The 10-inch and 12-inch guns in the fore-turrets of the port column were the only guns which could hope to hit at that time. The after-turret guns would not bear, and the range was too long for the 6-inch guns. The starboard column was outside 9500 yards, and partially masked by the port. The most vital point now for the Russians was to bring all their guns to bear, and to do so they must alter course to starboard and get into single line. They altered course to bring their guns to bear. Togo says that "the heads of the enemy's columns altered course a little to starboard when our main squadron bore down on them."

We assume that at 2.8 P.M. the leading Russian ships altered course together one point (11 degrees) to starboard, which would bring all guns

into bearing as each ship straightened in succession on the new course. After this alteration of course the range was altering at the rate of 250 yards a minute.

It is very doubtful whether at this stage any effective steps were taken to get into single line, which in any case would take ten minutes or more. When we remember the rapidity of the attack, its unexpected developments, and the Russian formation, it seems probable that no signal was made to do so. In default of specific orders an ordinary officer hesitates to act. At such a moment it is only an admiral of great experience and decision who would be equal to extricating his division from the impossible position in which it found itself. We are therefore inclined to believe that at this time the columns only altered course — leaders together, remaining ships in succession — sufficiently to bring their guns to bear.

At 2.14 P.M. the range was 6500 yards, and the Japanese opened fire. At this time the six ships of their main division had turned on the new course, and the bearings were such that all could concentrate their fire on the leading Russians, which Togo says they did. These were the *Oslyabya* and *Souvaroff;* but as the first was some 1500 yards nearer than the second, there can be no doubt as to which re-

ceived most of the fire from the 63 guns in action. The initial distance from *Oslyabya* was 6500 yards for the *Mikasa*—the leader—and 7100 yards for the *Nisshin*—the rear ship. As previously mentioned, the range was shortening at the rate of 250 yards a minute. The armoured cruiser division had not completed their turn.

On the other hand, the four Russian ships in the port column might have concentrated their fire at the same ranges on the *Mikasa*, and might have been supported by the two leading ships of the starboard column at the greater initial range of about 7800 yards. There is no evidence to show that they did so concentrate. In any case it is evident that the Russians were clearly outmatched. The guns in action at this time were presumably—

	Russian Port Column.		Japanese.	
12-inch	8	12	16	17
10-inch	4		1	
8-inch	...		6	46
6-inch	19		40	
4·7-inch	5		...	
	36		63	

Speaking of this period of the action, Togo says: "The enemy seemed to be gradually pressed towards the south-east, and both their columns simultaneously and gradually altered course to east, the enemy's fleet in consequence

being formed into an irregular single line column and proceeding parallel with our fleet."

We assume that at 2.18 P.M. the *Oslyabya*, under the pressure of the fire, put her helm up and altered course 28 degrees to lead the port column down to the other line, which it joined at 2.30; that the starboard column gradually altered course, and at 2.28 was steering east. During these movements the Russian fleet would have presented to Togo the appearance of an irregular single line column such as he describes. Diagram IV. shows on an enlarged scale the assumed condition at 2.23 P.M.

Togo's report proceeds: "The *Oslyabya*, which had been at the head of the left column, was soon defeated and fell out of the line of battle, a fire occurring on board her. The whole of the armoured cruiser squadron was now steaming in line in rear of the battleship squadron, and the concentrated fire of our entire fleet increased its efficiency in proportion to the decrease of distance." This gives some indication of the time. All the armoured cruisers would have straightened on the new course by 2.18 P.M., but their fire would not have begun to be effective much before 2.23. By the same time the battleships' fire had also become more accurate, as the range had been reduced and was changing much more slowly—not more than 60 yards a minute.

Diagram IV. shows the *Oslyabya* at 2.23 P.M., 5200 yards from the *Mikasa* and 5550 yards from the *Nisshin*. The *Souvaroff* is also seen to be only 600 yards farther off. The majority of the armoured cruisers are well within effective fighting ranges of the nearest Russian ships, and may have been closer than the diagram shows.

We assume that the *Oslyabya* left the line defeated at 2.23 P.M., or nine minutes after the Japanese opened fire. The shortness of the interval should not cause any surprise. The concentrated fire of 63 guns at effective ranges has always been terrible in its effect. In this case the Russians, who experienced it, declare that shells were rained on their decks. Admiral Rojdesvenski is reported to have said that the great enemy of the battleship is the sheet of flame due to constantly bursting shell. He is right. No ship, however large and thickly armoured, could have stood up against such a concentrated attack.

The *Oslyabya* was smothered under such a hail of explosions that she might well have been beaten in nine minutes, seeing that the *Varyag* was defeated in fourteen minutes by less than half the number of guns. Parallel cases are to be found in the history of the past. The *Chesapeake* was beaten by the *Shannon* in eleven minutes. At Trafalgar, the *Victory*, passing

under the stern of the *Bucentaur*, raked that ship with her whole broadside of 50 guns. Twenty guns were dismounted in the French ship, and her loss was estimated at 400 men. The time taken to inflict this injury was probably less than ten minutes. These concentrated attacks always produce decisive results. The difference between the present and the past lies in the method of concentration. In the Nelsonian era the range of the guns was short, and it was not easy to concentrate the fire of a superior number of guns on an enemy at effective ranges. Attempts were made to meet the difficulty by mounting the guns in tiers, as in three-decked ships and in the monumental forts of the nineteenth century. War experience did not favour the method, but showed the 74-gun ship to be a more suitable instrument than the three-decker. Nelson's concentrations were made by massing numbers of ships, and not by making the special use of his three-deckers which Rodney contemplated and arranged for, but never adopted in battle. With the present long-range guns it is still less necessary to concentrate the guns in a single ship or fort. The guns can be dispersed in several ships or batteries, from which the fire can be concentrated. This has long been recognised in the case of forts, and is now

shown to be equally true of ships. The great principle of dispersing the guns to concentrate their fire is emphasised and confirmed by the battle of Tsu Sima. This favours numbers rather than large dimensions, and is possibly at the back of the hesitation of America to follow our lead in increasing the size of battleships.

With the disappearance of the *Oslyabya* from the line the Japanese fire was naturally concentrated principally on the leading ships of the starboard column, as these decreased their range and drew in advance of the port column, to form the head of the irregular single line of which Togo speaks. At 2.33 P.M. the general position was as follows: The two fleets were steering east in single line, on parallel courses about 5000 yards apart, except the third Russian division, which was just beginning to turn in succession to east in the wake of the other divisions. The leading ships—*Mikasa* and *Souvaroff*—were nearly abeam of each other. The Japanese main division—six ships—could all concentrate on the *Souvaroff* and her second astern, which it is believed they did, the ranges being practically constant, and for *Mikasa* 5000 yards, for *Nisshin* 5500. The Japanese armoured cruisers—five or six ships—could distribute their fire among the remaining ships of the Russian first and second divisions, at ranges practically

constant and less than 5500 yards. On the other hand, these seven Russian ships might have concentrated on the *Mikasa* at the same ranges. It is believed they did not do so. The Russian third division could only bring their guns to bear on the Japanese armoured cruisers, from which they were distant from 5200 to 5800 yards, and closing at the rate of 160 yards a minute. It is clear that the Russians were still outmatched and at a tactical disadvantage. The results are set forth in Togo's comments.

His report goes on :—

"The *Souvaroff* and *Alexander II.*, which was second in the line, fell out of the line, a severe fire having broken out on board these ships. The confusion in the enemy's formation became more and more evident, and fires occurred on board several vessels which were bringing up the enemy's rear. The smoke carried by the westerly wind covered the whole surface of the sea, and combining with the fog completely enveloped the enemy's fleet, so that our battleship squadron was obliged to cease firing for a time. Our fleet also sustained more or less damage. The *Asama*—armoured cruiser—was struck by three shells near the water-line aft. She had her steering-gear damaged, and began to leak badly. She had therefore to leave the line of battle for a while, though shortly after she, having effected provisional repairs, was able to rejoin the line. Such were the main features of the fighting between the opposing main forces up to about 2.45 P.M., by which time the issue of the day had already been decided."

Some doubt appears to exist as to the name of the second ship which left the line,—whether it was the *Borodino* or *Alexander II.* It is not a material point. We shall not be, perhaps, very wrong in assuming that the two leading Russian ships were beaten and left the line by 2.38 P.M., about fifteen minutes after the *Oslyabya*, or twenty-four minutes after the Japanese opened fire.

We have now reached the stage when any advantage due to superior speed should begin to make itself felt. Up to this time the tactical advantage had been due to good judgment in turning up at an appropriate bearing and distance and to steering a suitable course. At 2.33 P.M. the two fleets were 5000 yards apart and steering east on parallel courses at unequal rates of speed — the one going 14½ knots, the other 12 knots. At 2.37 P.M. they were exactly abeam of each other. So long as the leading ships remain abeam of each other, at a constant distance, no tactical advantage can accrue to either. What courses must they steer to preserve these conditions? They must steer round on circles with radii varying directly as their speeds and dependent on the distance between the fleets. The shorter the distance the smaller the circles.

In this particular case the radii would be 12

and 14½ nautical miles respectively, and the course would alter at the rate of about one degree in one minute of time. If the two leaders began to circle at 2.37 P.M., when they were steering east and exactly abeam of each other, they would have altered course 23 degrees by three o'clock, and would then be steering S. 67° E. But at 2.38 P.M. the *Souvaroff* and her consort left the line. This altered the relative bearings of the leaders 9 degrees. To preserve the beam bearing, the new Russian leader must at once make this additional alteration in the course. The resulting course at three o'clock would be S. 58° E. instead of S. 67° E. This agrees very fairly with Togo's report, which reads—

"Our main force thus pressed the enemy to the south and fired intermittently on his ships whenever we sighted them through the smoke and fog. At about 3 P.M. we were already ahead of the enemy's fleet and were steering in a south-easterly direction, when they suddenly altered course to the north and appeared as if intent on passing our rear and escaping to the north. Our battle squadron at once turned together to port and steered in a north-westerly direction, the *Nisshin* leading. The armoured cruiser squadron altered course in succession and followed the battleship squadron."

For our present purpose it is not necessary to follow further the remaining fortunes of the fight. The Russians turned to starboard (to

the right) in succession, while the Japanese main division, as has been said, turned together to port (to the left). It is not clear why Togo turned away, thus increasing his distance from the enemy, instead of towards him, with a view of closing and completing his destruction then and there. What prevented him doing so? We do not know. It may have been that the armoured cruiser squadron, which seems to have acted throughout somewhat independently, was on his starboard quarter and prevented a turn to starboard. Or he may have hesitated to enter the dense cloud of smoke which he says hung to leeward of the Russian fleet. Whatever the cause, the Russians were enabled to get away, and their destruction was left to be completed during the night and the following day.

In Diagram III. the solid curves show the two fleets circling, and the one maintaining the other not only on its beam but at a constant range of about 5000 yards. As nothing definite is known about the range, it is necessary to examine the conditions under which it might have altered. If either side wished to close, it was perfectly feasible for him to do so without materially altering the bearings. If the 14·5-knot leader steered a course 5 degrees inside that required for circling at a constant distance

from the enemy, she would close him at the rate of about 42 yards a minute, and be retarded on the common line of advance only about 1·5 yards a minute. The dotted curve on Diagram III. is drawn on the supposition that the *Mikasa* did thus steer, and shows the relative bearing, practically constant, and the range, decreasing gradually from 5000 yards at 2.28 P.M. to 3560 yards at three o'clock. Under the same conditions the 12-knot leader would close at the rate of 35 yards a minute, and maintain the relative bearing practically constant. The opposite side might in either case foil the attempt to close, and maintain the range constant by altering course a little more in the case of the slower ship and a little less in that of the faster. The fleet with superior gun-fire really controls the minimum range, which depends little, if at all, upon the Whitehead torpedo.

Diagram V. shows the modification required in the "approach" if the two fleets possess equal speeds of 12 knots. To reach the same results under these conditions, the turns must be made so as to place the *Mikasa* at 2.8 P.M. 7500 yards due north of the *Oslyabya* instead of 8000 yards N. 18° W. as in Diagram III. The Russian leaders bear away 22 degrees instead of 11 degrees to bring their guns to bear. Otherwise both sides act as before, except that

there is no circling. The fleets continue to steer parallel courses. The possibility of closing is practically the same as when circling. The fact is that when two fleets are ranged in two parallel lines, whether curved or straight, little tactical advantage is to be derived in practice from any superiority of speed.

The picture which we have drawn is not to be taken as an exact representation of what actually happened. The diagrams do not pretend to be exact plans of the battle, but they are believed to show its broad features. They indicate what was possible and probable, and mark the limiting conditions. No attempt has been made to show the confusion which prevailed in the Russian order under the terrible fire. The ships of both sides are assumed to have kept correct station, but this must have been far from the case, especially on the part of the Russians. It is for the reader to complete the picture, helped, it may be, by such further reliable details as may be published.

This study of the battle supplies strong evidence that the Japanese victory was due to superior skill in tactics and not to superior speed. The formation of the Russian fleet was faulty in the extreme. Admiral Togo took full advantage of this, and by his skilful approach brought a great superiority to bear on a part

of the enemy—the leading ships—and defeated them before they could be supported by the remainder. At the same time, he so disposed his own ships that they mutually supported each other, and none were exposed unaided to a superior concentrated attack. No doubt something was due to the better shooting of the veteran Japanese seamen. But this was largely a consequence arising from superior tactics, in that during the critical period of the battle the Japanese steered a straight course, and kept their guns bearing steadily on the enemy; whereas the Russians, at that time, did not do so. Again, the Russian fire was kept under by superior concentration, a much more powerful method of defence than covering ships with impenetrable armour. In this connection it is important to note that the battle does not support the argument for an exclusive armament of 12-inch guns. The victorious fleet mounted a greater number of guns—127 to 100, and carried less than half the number of the heaviest natures—17 to 41. Doubtless stress will be laid on the superior effect of the 12-inch gun on the structure of a ship. The *matériel* school will forget that the great object in battle is to upset the moral equilibrium of men rather than to perforate armour. They will not understand that it pays better to defeat the crew

and capture the ship, than to sink her. The Russians alone are in a position to say whether a hail of 6-inch shell is more trying than less numerous 12-inch shell. The larger gun, no doubt, makes better shooting at long ranges, but at decisive ones—5000 yards and under—the difference is not great. It is the business of an admiral to concentrate on a part of the enemy at decisive ranges, with a view to crushing that part before it can be supported. To play at long bowls and miss the opportunity, as did Togo on August 10, is to increase the probability of chance hits. The battle confirms the experience of peace exercises, that when one side means business fleets rapidly close to decisive ranges, unless the other side runs away. Hence, a ship should be armed with a view to fighting not solely at long distances, but also at decisive ranges.

In the pages of 'Blackwood's Magazine' for May 1905 we stated "that neither in practice nor in theory has it ever been proved that superior speed gives any tactical advantage, unless it be thought an advantage to be able to run away." We wrote advisedly, being aware that high speed was much in favour, and that it had been determined to give increased speeds to all classes of ships about to be laid down. We doubted the wisdom of doing so,

because it had been proved by an acute and competent hand, and confirmed by our own observations at sea, that a superior speed of 2 or 3 knots does not give any particular tactical advantage to a fleet. In one short month after the words were written, a battle was fought which, so far as it went, afforded a practical demonstration of the correctness of our view. On a matter of such great importance it is unwise to come to a hasty conclusion. Immense sums of money are involved. The question is mainly tactical, lends itself to experimental treatment, and should be thoroughly investigated. It is suggested that this should be done. When our different fleets meet, tactical exercises should be carried out with this object, and among other practices the tactics of the battle of Tsu Sima might be reproduced. Officers would then have a practical demonstration of what is possible under such conditions, and would be able to draw their own conclusions.

The importance of the question lies in the fact that speed is one of the elements in a ship of war, and cannot be increased without the sacrifice of some other element. The amount of this sacrifice can best be shown by special instances. The *Bulwark*, *Montagu*, and *King Alfred* each cost a little more than a million sterling. Their speeds are 18, 19, and 23 knots

respectively. The extra knot of speed given to the *Montagu* involves about 20 per cent less armour protection than that of the *Bulwark*. The additional 4 knots of the *King Alfred* is balanced by a further sacrifice of about 20 per cent of armour, besides a reduction in armament represented by the difference between four 12-inch with six 6-inch guns, and two 9·2 inch with eight 6-inch guns. Again, compare the American ships *Louisiana* of 16,000 tons, 18 knots, and *West Virginia*, 13,700 tons, 22 knots. The first carries 5300 tons of fighting power — armour and armament — and 1500 tons of motive power. The figures for the second are 3059 and 2060 tons respectively. Some idea of the sacrifice in money can be seen by comparing the *Idaho* of 13,000 tons, 17 knots, with the *Louisiana* of 16,000 tons, 18 knots. Each possesses approximately the same protection and coal endurance. The broadside of each consists of four 12-inch and four 8-inch guns, supplemented by four 7-inch in the *Idaho* as against six 7-inch in the *Louisiana*. These ships cost respectively about £1,200,000 and £1,500,000, so that the addition of two 7-inch guns to the broadside and one knot to the speed costs about £300,000. Is the money well laid out?

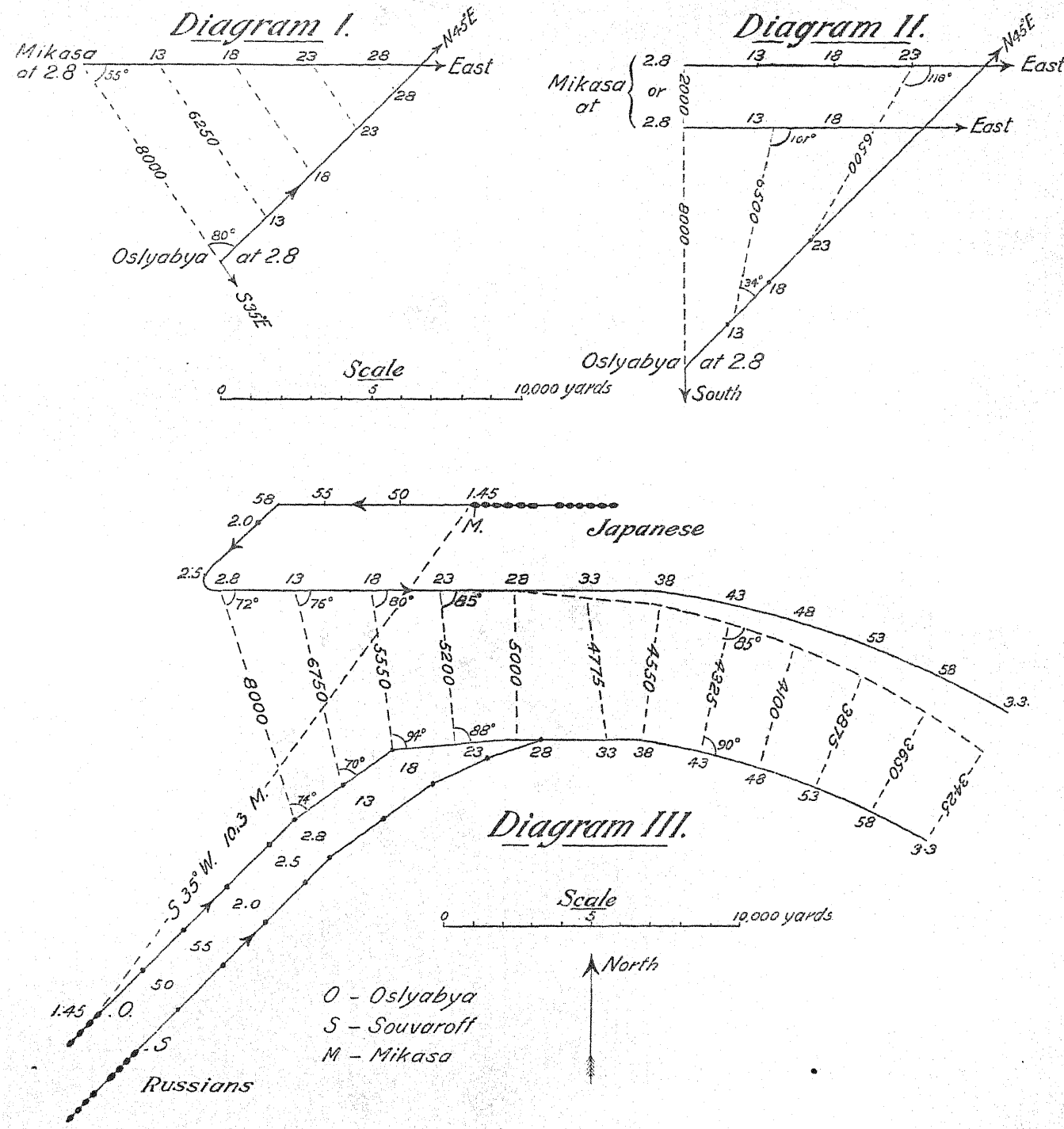
When it is remembered that the ships named —whether battleships or armoured cruisers—are

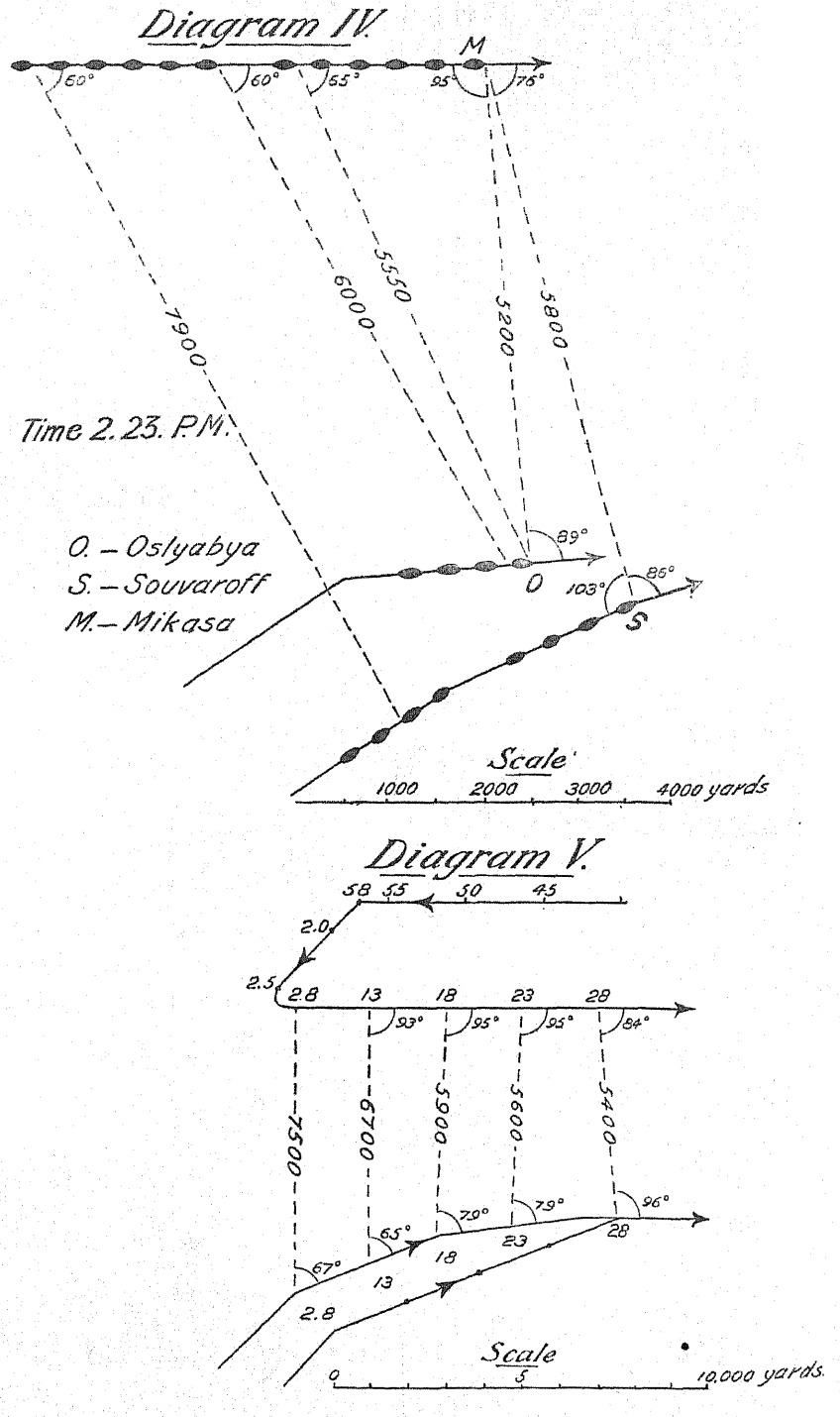
really all capital ships, which must necessarily be concentrated in time of war and take their places in the line of battle, it is difficult to see how the sacrifice of fighting power to speed can be justified. The argument runs thus: Battles are the supreme test of the capital ship. They are decided by superior tactics, and fighting power. Superior speed confers little, if any, tactical advantage. Fighting power depends upon its offensive rather than on its defensive form—upon weapons rather than on protection. Speed is not a weapon, and does not give protection, except in running away. The aim should therefore be to endow a fleet not with superior speed or protection, but with superior offensive power—*i.e.*, gun power. We say a fleet, and not a single ship, advisedly, because it is misleading to consider a battleship as an isolated unit.

In the face of these arguments how can the *matériel* school defend the increased speed given to the ships now building? how can they justify the sacrifice of fighting power to speed in the armoured cruisers? They may point to the practice of other nations who are following their lead, but that will help them little unless they can rebut our arguments. America hesitates to follow the British example. If they do not fully accept the

lead from Whitehall, it will be a refreshing act of independence, for Admiralties are very much like sheep, and often follow each other without reasoning down to the bed-rock on which their policy should lie. They did so after the battle of Lissa in 1866, when all adopted rams without adequate reason, and again, after the American Civil War, when coast-defence ships came into fashion. But the greatest blunder of all was the development of the large armoured cruisers by France and Russia — a mistake now realised by the foremost French thinkers. They were originally intended to be used against our commerce, but the manœuvres in the Channel in the year 1901 confirmed the lessons of the war of 1812, and showed that they would be driven to act in squadrons, and thus were virtually battleships, in which fighting power is more important than speed. For consider the case of two hostile squadrons operating against each other: one composed of six battleships — say *Républiques*, the other of six armoured cruisers—say *Victor Hugos*,—the first superior in fighting power, the second in speed. The crews will be about the same in number —4200 men. What are the fast ships to do? Are they to run away? Four thousand men cannot continue to run away from an equal number. To do so would involve a fatal loss

of prestige. They must fight, and as their extra speed will not help them they will be at a disadvantage. It is true that seven *Victor Hugos* can be built for the same cost as six *Républiques*, but the expense of maintaining the extra crew will turn the balance of cost the other way, and the extra guns will not equalise the fighting power. The fact is, that the large armoured cruiser or fast battleship is based on two fundamental errors. The first is, that the large ship is the most effective instrument with which to destroy commerce. The whole experience of war shows that the very reverse is the case. The attack on trade requires dispersion of force, and has always been most effective when made by a large number of small ships and not by a small number of large ones. The second error is, that the enemy will run away. It is a mistake begotten of a long peace. On the day when Britain again fights for the dominion of the seas the enemy will certainly not run away. He will come out to fight, as did the Greeks at Salamis, the Romans during the First Punic War, the Dutch during the seventeenth century, and the French at Beachy Head, Malaga, and during the American War of Independence. Every guinea diverted from fighting power to speed will be bitterly regretted on that great day.


Diagram I.
Mikasa at 2.8
13
18
23
28
East
N45°E
55°
28
23
18
13
6250
8000
80°
Oslyabya at 2.8
S35°E
Scale
0
5
10,000 yards
Diagram II.
Mikasa at
2.8
or
2.8
13
18
23
East
N45°E
118°
2000
13
18
East
101°
6500
8000
6500
23
34°
18
13
Oslyabya at 2.8
South
Japanese
58
55
50
1.45
M.
2.0
2.5
2.8
13
18
23
28
33
38
43
48
53
58
3.3
72°
76°
80°
85°
85°
8000
6750
5550
5200
5000
4775
4550
4325
4100
3875
3650
3425
94°
88°
90°
70°
74°
10.3 M.
S 35° W.
18
13
2.8
2.5
2.0
55
50
1.45
O.
S
Russians
Diagram III.
Scale
0
5
10,000 yards
North
O - Oslyabya
S - Souvaroff
M - Mikasa


Diagram IV.
M
60°
60°
55°
95°
76°
7900
6000
5550
5200
5800
Time 2.23. P.M.
O. – Oslyabya
S. – Souvaroff
M. – Mikasa
89°
O
103°
86°
S
Scale
1000
2000
3000
4000 yards
Diagram V.
58
55
50
45
2.0
2.5
2.8
13
18
23
28
93°
95°
95°
84°
7500
6700
5900
5600
5400
79°
79°
96°
65°
67°
28
23
18
13
2.8
Scale
0
5
10.000 yards.

The truth is, that the conceptions of war held by the present naval advisers of the Government are fundamentally unsound and opposed to the lessons not only of the past but of the war just ended. In battleships they are relying on great size rather than on superior tactics, which indicates an attitude of mind defensive rather than offensive, — a disposition to exalt the ship above the man. In armoured cruisers fighting power is sacrificed to speed, which must be based on the idea not of fighting but of running away on one side or the other. Both views are equally destructive of the true spirit and are opposed to the traditions of the Navy. Again, massing the armoured cruisers will leave our trade exposed to the attack of a number of small hostile ships, to meet which no provision has been made. The ships which could have been used against them have been declared useless and obsolete. This is a peace idea, since it is an historic fact that the small ship multiplies and increases under the stress of war.

VIII.

THE GROWTH OF THE CAPITAL SHIP.[1]

THE dimensions of a capital ship of war, or ship of the line, depend partly upon strategy and partly upon tactics,—upon strategy, because it settles where, when, and with what force a battle shall be fought; upon tactics, because they deal with the use of military force in the battle. Both in strategy and tactics moving forces are the subject under discussion, and we have to treat of space, of time, and of the distribution of force. The strategic "where" and "when" governs the space and time requirements and the power of movement given to the ship. The distribution of force demanded by strategy and tactics rules the fighting power or armament. To move and to fight are the two great objects for which a ship of war exists. Mobility and fighting power exercise a separate influence on her size. To meet the requirements of space and time, mobility must

[1] Blackwood's Magazine, May 1906.

be enduring; upon its extent depends the distance which can be traversed from supplies, and the time which can elapse before these are renewed. The necessity of providing enduring mobility forms the initial stage in determining the minimum dimensions. The final size is fixed by the demands of the fighting power. To the superficial mind this last favours ever-increasing dimensions, but all war experience indicates a limit beyond which strategical and tactical requirements call for distribution rather than concentration of fighting power.

In the time-honoured pages of Defoe is to be found a simple illustration of the principles underlying the development of navies. When Robinson Crusoe designed to leave his island home he built a canoe, fitted it with mast and sail, stored it with food and water, and armed it with gun and ammunition. But when the boat was completed, it did not satisfy his strategic necessities,—it was not large enough to carry him across the water to *terra firma* forty miles distant. He was limited to a coasting-trip, and even then found himself single-handed at the mercy of the elements, unable to control his ship, and in danger of starving. Profiting by this experience, he built his next ship much larger, and his man Friday summed up her qualities by declaring that she would carry

"much enough vittle, drink, bread," and that "he venture over in her very well though great wind blow." He meant that this boat was seaworthy and large enough to carry the men, stores, food, and water necessary for the voyage, whereas the first one was neither the one nor the other. This little story is typical of the methods by which both sailing and steam navies have been developed. It will be instructive to examine these methods, and to trace the growth of the capital ship. Our object will be to determine the underlying principles, which would seem to be the same whether the ship is moved by wind or by steam.

The original of the Nelsonian ship of the line is to be sought in the Elizabethan navy. Then it was that reliance was first really placed on the gun as the principal weapon. The ships of Henry VIII. had indeed been armed with artillery, but it was not until power passed into the hands of seamen with the experience of Hawkins and Drake that the ships themselves were transformed into handy instruments of war. The *Repulse* may be taken to represent the new type. Built in the year 1596, after the long experience gained during the war with Spain, she was about the same size as the *Ludlow Castle* of 44 guns, built in the year 1744, and, like that ship, is believed to have

been practically a two-decker. The two ships were nearly identical in length, breadth, and depth of hold, but differed in the following particulars:—

	Burthen in tons.	Number of men.	Number of guns.	Weight of ordnance in tons.	Weight of broadside in lb.
Repulse . .	622	350	38	54	278
Ludlow Castle .	725	250	44	70	282

Both ships carried 18-pounders, 9-pounders, and 6-pounders, but on board the *Repulse* were also to be found a few 32-pounder and 24-pounder guns. We are to note the results of a century and a half of experience. In ships of the same dimensions the weight of the broadside remains the same, but, owing to improvements in guns, the weight of armament is increased about 16 tons. Thus the fighting power is somewhat raised in deference to tactical expediency, which always keeps in view that the primary object is battle. On the other hand, the complement of men is reduced one hundred, in order that the ship may keep the sea longer. As in the case of Crusoe's canoe, strategic necessity exercised a controlling influence, but this requires full explanation.

The sea-keeping capacity, or enduring mobility, of the sailing-ship was gradually developed under strategic necessity. It was limited by the stowage of provisions in the days of Drake, of beer

under Shovel and Hawke, and of water in the fleets of Nelson, just as it is now by that of coal. In the Tudor navy the ships stowed sufficient provisions to feed their full crews about one month. The strategic inconvenience of this short allowance was shown during the Armada year. On July 7 the English fleet, under Howard and Drake, being in the Chops of the Channel, bore up to run down before a fresh northerly wind, to take offensive action against the Spanish fleet. They had then only provisions for thirteen days. Two days later the wind chopped round to south-west, and want of food compelled the fleet to return home. Like Crusoe, Howard was tied to his island, and for the same reason. During the Tudor period the difficulty was met by attaching to large ships and naval expeditions victuallers, which played the same part as Rojdesvenski's colliers. But as years rolled on improvements were made. Ships were built with larger stowage. Thus, in the years 1663-64, attention was drawn to the French 60- to 70-gun ships, which carried their lower deck guns four feet from the water, and stowed four months' provisions; whereas in English ships the guns were only three feet from the water, and the provisions only sufficient to last seventy days. The superiority of the French ships appealed to the men who had been with Blake in the Mediter-

ranean and with Penn in the West Indies. Two ships — the *Warspite* and *Defiance* — were built to stow six months' provisions, and to carry their guns four and a half feet above the water.

The enduring mobility was also sometimes increased, when necessary, by reducing the number of guns and men. Thus the establishment of the *Captain*, which was launched in the year 1678, and took part in the battle of Beachy Head, was 70 guns and 460 men at home, but only 62 guns and 380 men abroad. In such a case fighting power was for a time sacrificed to the strategic necessity for enduring mobility. This expedient was usual during the wars at the end of the seventeenth and the beginning of the eighteenth century, but was discontinued as ships increased in size. At this time the stowage was not the same in all classes of ships. In fourth-rates it was four months, in fifth-rates three months, while in sixth-rates it was only two months. Thus, the sloop was then as much inferior to the frigate in enduring mobility as is now the modern gunboat to the cruiser. As late as the year 1744 the stowage appears to have been four months for ships of the line, as is shown by an official letter to Admiral Sir John Norris, the president of a Committee on Designs. On this basis the *Ludlow Castle* would have carried

about 180 tons more than the *Repulse*. By reducing the crew this became about 100 tons, which was presumably met by improvements in the lines or form of the ship. Had the crew not been reduced her dimensions must have been increased. It was not until the latter part of the eighteenth century that the stowage in all classes of ships became equal to six months' provisions and three months' water. If the "time capacity" of the Elizabethan capital ship was thirty days and her average daily run was seventy nautical miles, as against ninety days and one hundred nautical miles in the Nelsonian era, the "space capacities" would be about 2100 and 9000 nautical miles respectively. The enduring mobility had been multiplied by three as regards time, and by four to five as regards space.

It is noteworthy that in 1805 the ship of the line and the frigate each carried water sufficient to last about three months. The necessary "time capacity" had been determined practically, and was the same in each case. The "space capacity" was not the same. It was higher in the frigate than in the ship of the line, because the former was usually faster and acted singly, whereas the latter was held back by the delays inseparable from sailing with other ships. This accorded with strategic necessity,

which required the frigate to traverse greater distances. Her mission was to keep open the lines of communication and seek intelligence. The duties of the modern cruiser, and the strategic necessities under which she acts, are identical with those of the frigate. It is equally necessary that her "space capacity" should exceed that of the battleship.

An example of the strategical influence of the water carried is given by Nelson's chase of Villeneuve to the West Indies. His ships completed with water at Tetuan on 5th May, and did not receive any further supply—as he told the Queen of Naples — until their return to Gibraltar on 19th July, when they watered and completed to four months' provisions and stores for home service. The ships had been seventy-five days dependent upon what they carried, and on arrival should have had water equal to about fifteen days' consumption, if the allowance had not been reduced. This probably influenced the movements of the fleet, as the margin was narrow, if the possibilities of head winds and the uncertainties of war are remembered. Again, six of his ships were absent from the fight off Trafalgar. They had been sent away to complete with water and provisions, and had not returned. Water was to Nelson what provisions were to Drake and coal is to

a modern admiral. The influence of enduring mobility on the minimum size of a ship of war, and the close analogy between the water carried in the past and the coal stowed in the present day, are illustrated by the proportion of the displacement absorbed in each case. This varied from 8 to 10·5 per cent in the later types of the ships of the line, and from 9 to 13 per cent in battleships built during the last fifteen years.

The development of fighting power now requires attention. The *Ludlow Castle* was an example of the growth of enduring mobility while keeping the fighting power constant. But from the same original—the *Repulse*—sprang a series of ships in which the two qualities increased concurrently. The seventeenth century saw no real advance in fighting power previous to the Dutch wars. Under the stress of the many severe battles with that navy its paramount importance became evident. Gun armaments and, as a consequence, tonnage were gradually increased, and after the Third War ended in the building programme of the year 1677.

That programme provided for the construction of thirty ships—consisting of one first-rate, nine second-rates, and twenty third-rates. Their leading particulars were—

	Number of guns.	Burthen in tons.	Weight of ordnance in tons.	Weight of broadside in lb.	Number of men.
First-rates .	100	1739	188	933	780
Second-rates	90	1546	160	761	660
Third-rates .	70	1072	124	620	460

The third-rates were two-deckers, and were the direct development of the *Repulse*. They gradually increased in size and power during the eighteenth century until they became the main strength of the Nelsonian fleets. The underlying influence was the necessity not only for increased enduring mobility, but for improved seaworthiness and greater fighting power. The first- and second-rates were three-deckers, which, originating with the *Sovereign* in the year 1637, or perhaps with the *Prince* in 1610, also slowly grew in size, and continued throughout the life of the sailing navy to form a small and decreasing proportion of the ships of the line.

The proportion between the number of three-deckers and two-deckers is still a question of living interest. It is still important to determine, whether all capital ships should be of the largest size and power, or whether a proportion should be of moderate dimensions. The problem is the distribution of fighting power best suited to the operations of war, and is quite irrespective of the motive mechanism.

When the under-mentioned wars broke out

the proportion between the number of three-deckers and two-deckers was as follows:—

	Spanish Succession.	Seven Years'.	American Independence.	French Revolution.	With Napoleon.	At the Peace.
	1702.	1756.	1778.	1793.	1803.	1815.
Three-deckers.	36	16	20	21	21	15
Two-deckers .	90	57	101	92	90	94
Percentage of three-deckers	28	22	16	19	19	14

The British shipbuilding data confirm these figures. The proportion of three-deckers in the 1677 programme, before referred to, was 33 per cent; in the case of the ships built during the reign of Queen Anne (1702 to 1714) it was 23 per cent; of George I. (1714 to 1727) 40 per cent; of George II. (1727 to 1760) 21 per cent; and of George III. (1760 to 1820) 15 per cent. Sixteen per cent of the ships of the line built during the French Revolutionary War were three-deckers. The proportion was a maximum during the early part of the eighteenth century, and fell considerably after the Seven Years' War. Our forefathers evidently considered that the greater number of the ships of the line should be of moderate size and power, but that these should be supplemented by a few larger vessels. Their preference was based on war experience, and is entirely opposed to the prevailing modern view, which rests on peace practice, and favours capital ships of the largest size. What were

their underlying reasons? If we can determine these, it may be that we shall see the causes of the difference on a question of principle between the views held in the eighteenth century and to-day.

The aim and object in developing a military navy is to produce fighting power at a minimum cost, and to so distribute it that it may be used with maximum effect. In the sailing navy, fighting power was fairly measured by weight of broadside.

Six years after the Peace of Utrecht, in the year 1713, which closed a period of nearly twenty years of war, the size, fighting power, and cost of building and equipping a ship ready for sea, without armament, were as follows :—

	Cost.	Burthen in tons.	Weight of broadside in lb.	Crew.
100 guns . .	£40,183	1869	1000	780
90 " . .	32,886	1566	803	680
80 " . .	27,337	1350	656	520
70 " . .	21,714	1128	522	440
60 " . .	17,831	951	435	365
50 " . .	13,212	755	315	280

These figures show that the cost per unit of broadside was at that time nearly the same in all classes of ships of the line: three-quarters of a century later it had risen, but was slightly lower in the 74 than in ships larger and smaller. This means that at the first period the distri-

bution of the fighting power — in other words, the size of the ship — was a purely military question, dependent upon strategy and tactics; at the second period cost had also to be considered, as in some degree it favoured the 74. The practical solution of the question by the seamen of the day, after ten years' war experience, is shown by the composition of the fleets at the battle of Malaga in the year 1704—

	British.	Dutch.	French.
Ships of 90 guns and above	5	1	7
Ships of 80 to 90 guns	9	...	9
Smaller ships of the line	25	11	35
	39	12	51
	51		

Two or three of the French ships carried 100 guns and upwards, but none of the British. Several points are to be noticed. The two fleets were equal in point of numbers. The main strength of each was to be found in ships of moderate size. The ships of 80 guns and upwards were three-deckers, and the proportion of these large ships was the same in each fleet. Hence the broad conclusion that war had brought about a distribution of force alike on both sides. The ships or instruments of war tended to become similar and equal, but the French vessels were generally held to be the better models. This is the great law of equality

which will be seen constantly in operation throughout the life of the sailing navy.

The battle of Toulon, forty years later, showed a great change in foreign shipbuilding policy. Of twenty-five ships in the British fleet under Matthews, thirteen were three-deckers of 80 guns and upwards, whereas in the Franco-Spanish fleet of twenty-eight ships only one Spanish ship was of that class. During the interval Great Britain had introduced no changes in shipbuilding. She still depended upon the instruments, which had given her success during the wars of William III. and Anne. On the other hand, both France and Spain had ceased to build three-deckers, and had turned their attention to developing the two-decker. The result was seen when the Spanish *Princessa*, of 70 guns, was captured in the year 1740. That ship measured 1700 tons, as against the 1225 tons of the British *Monmouth*, of 70 guns, built in the year 1742. Three years later a memorandum due to Rear-Admiral Medley showed that the French 74's and 64's were superior to British ships of 90 and 70 guns respectively. The weights of broadside were—

British.		*French.*	
90 guns	= 803 lb.	74 guns	= 852 lb.
80 "	= 656 "		
70 "	= 522 "	64 "	= 552 "
60 "	= 459 "		

This was forcibly brought into notice in the year 1747 by the capture of four French 74's: the smallest of these was of 1590 tons burthen, and the three others averaged 1800 tons. Three 64's taken in the same year averaged 1360 tons. British 70-gun ships then building averaged about 1400 tons, and 60-gun ships 1200 tons. Out of these unfavourable comparisons and the general complaints of the inefficiency of existing ships grew a shipbuilding reform in Great Britain. The law of equality began to act. The instruments of war on either side were no longer equal in power and seaworthiness, or similar in design, and the object was to restore equality. The British superiority in numbers, which had given success during the War of the Austrian Succession and had led to the destruction of the French squadrons under La Jonquière and L'Étenduère, was in danger of being counterbalanced by inferiority in the ships. The changes brought about in half a century will be seen by giving the leading particulars of the ships which took part in the Seven Years' War.

On the outbreak of hostilities the main strength of the French Navy consisted of—

Ships of	Burthen in tons.	Weight of broadside in lb.	Crew.
80 guns	1890	964	800
74 "	1790	852	650
64 "	1360	552	450

The ships which were gradually added to the British Navy in the course of the war were—

Ships of		Burthen in tons.	Weight of broadside in lb.	Crew.
100 guns		2046	1182	850
90 "		1827	907	750
80 "		1580	770	650
74 "	24-pounders	1825	880	650
74 "	18-pounders	1609	790	650
64 "		1380	504	500

The French ships were all two-deckers, whereas the British, of 80 guns and upwards, carried their guns on three decks, but, unlike their prototypes in the days of Shovel and Benbow, were able to keep the sea in all weathers. The first of the new designs was the *Royal George*, of 100 guns, Hawke's flagship, in which he faced the fierce winter gales off Quiberon. The famous *Victory* followed her in the year 1765. One of the finest ships in the French Navy—the *Foudroyant* of 80 guns—was taken in the year 1758. She was seen to be equal to the newly designed British 90-gun ship. This killed the new British 80-gun ship, of three decks, and no more were built; but those existing were not broken up,—they continued to be of great service during several years of war, although much inferior in fighting power to more than twenty ships of France and Spain. According to modern ideas, they should have been swept away; but our forefathers, having a knowledge of war which

we lack, took an entirely different view: they did not think that every 74 became obsolete when a 100-gun ship was launched. They would never have enunciated the entirely false doctrine that the launch of the *Dreadnought* makes all older battleships obsolete. Weapons become so more rapidly than ships, which, if properly designed to meet strategical and tactical necessities, remain effective and useful much longer than is now generally supposed. It is a noteworthy fact that with the experience of two prolonged wars to guide them the British Admiralty continued to build 74's of the smaller, in preference to the larger, class, of which only two were launched previous to the French Revolutionary War. It was not until then that 80-gun two-decked ships, and the larger 74's, were built in limited numbers.

At the opening of the Seven Years' War, the ships of the line available for service on either side were not so unequal in numbers as has been sometimes assumed. Out of a nominal force of sixty the French had forty-five fit for service, while the British had fifty to sixty available out of a nominal seventy-three. In the several general actions which took place, the deciding factors were neither numbers nor individual ship superiority, but leadership and tactics. At Minorca, in May 1756, Byng had

thirteen to the twelve of La Galissonière; the forces were practically equal, and the leadership not unequal; the result was indecisive, but disadvantageous to Great Britain. In August 1759 La Clue, with ten ships of 64 guns and upwards, was badly beaten by Boscawen with thirteen, of which four were of 60 guns. Collectively the fighting power of the French fleet was inferior in number of guns—706 to 916,—but much less so in weight of broadside—about 7400 lb. to 8300 lb. Individually their ships were superior. Individual superiority was opposed to numbers, not only in ships but in guns, and victory was on the side of numbers, not on that account but because the French ran away and exposed themselves to be beaten in detail. At Quiberon, in November of the same year, Hawke had twenty-three ships, mounting 1666 guns to twenty-one of Conflans, mounting 1492, but the weights of broadside were equal, and approximated to 160,000 lb. The small British numerical superiority in ships and guns was balanced by the individual superiority of the French. It is true that the *Royal George* of 100 guns was present in the battle, and was considerably superior to any other single ship, but she did not affect the result. Hawke won, because Conflans ran away and left his rear

ships to be beaten in detail. The superior speed of his new flagship—the *Soleil Royal*—enabled the French admiral to do this most effectually. At the peace in the year 1763 France had lost upwards of forty sail of the line, whereas the British ships of that class had increased from seventy-three to one hundred and eighteen. The navy with the inferior ships had won.

Both sides continued to build ships of the types already referred to, and France more than matched the British 100-gun ship by starting a class carrying 110 guns. The tendency in shipbuilding was towards individual equality in each class, with France leaning decidedly towards superiority. The French defeats had shown that as an instrument of war the size and power of the ship of the line within limits are of less importance than the way in which she is used; that shipbuilding counts less than tactics and strategy; that the spirit of the navy and its knowledge of war are the deciding factors. France took the lesson to heart, and started a systematic study of war, supplemented by experimental squadrons for practising tactics. The result became apparent when France and Spain intervened in the American War of Independence, in the year 1778. The ship of the line had then nearly reached its

final development in the three navies. The British 100-gun ships were more than equalled by the French three-deckers of 110 guns; the British 90-gun ships were matched by the French and Spanish 80-gun two-deckers; but the main strength of each fleet was formed by 74-gun and 64-gun ships, of which the British types were inferior.

As is well understood, the general conduct of the war was faulty in the extreme. The British had no preponderance of force over the combined navies of France and Spain. Their only chance of success lay in a vigorous and concentrated offensive. They should have directed their whole strength against the enemies' fleets in Europe, with a view to destroying them when they first put to sea. Concentration at the decisive point would have acted reciprocally, and forced similar action on the enemy or entailed his defeat. Instead of doing so, they frittered away their strength in detachments, and allowed the French squadrons to get away unmolested. They found themselves weak everywhere and strong nowhere, with the result that a number of indecisive actions ensued. The important exception was the battle of Dominica, on April 12, 1782, in which Rodney won a decided victory, and captured five sail of the line, including De Grasse, the French Com-

mander-in-Chief. A comparison of the fleets engaged affords a good illustration of the then distribution of fighting power in the two navies :—

French.		*British.*	
1	of 104 guns.	4	of 98 guns.
5	" 80 "	1	" 90 "
20	" 74 "	20	" 74 "
1	" 70 "	1	" 70 "
3	" 64 "	10	" 64 "
30		36	

The British fleet were superior in numbers —thirty-six to thirty — and of guns, 2672 to 2246; but in fighting power, measured by the total weight of broadside, the difference was small—about 261,000 lb. to 252,000 lb. The fleets were practically equal, the British numerical superiority being balanced by the individual superiority of the French ships. As at Malaga, the main strength of each was to be found in ships of moderate size. The proportion of large ships—80 guns and upwards —was rather larger on the side of the French. The more numerous fleet won, but not on that account: as at Quiberon, the victory was due to a tactical advantage, and not to any particular quality in the ships.

After the Peace of Paris, the French reviewed the qualities of their ships by the light of war

experience, and embodied their ideas in the Ordinance of the year 1786. The leading particulars of the ships proposed to be built in future were—

	Displacement in tons.	Burthen in tons.	Weight of broadside in lb.	Crew.
120 guns . .	5246	2747	1380	1062
110 " . .	4910	(?)	1286	1001
80 " . .	3825	2223	1125	812
74 " . .	3548	1887	1010	614

As compared with the ships in use during the Seven Years' War, an increase in size and power will be noticed, large in ships of 80 guns and upwards and small in the 74.

When the Revolutionary War broke out in the year 1793, French ships built on these designs were already afloat, but British ships of corresponding power were not yet in being. The law of equality was then just beginning slowly to act. In that year the first British 80-gun two-decked ship was launched, the first 110 followed two years later, and it was not until the year 1807 that a 120-gun ship was completed. But these new British ships were not the deciding feature in the struggle. Not one of them was present at the battles of St Vincent, the Nile, or Trafalgar. The brunt of the work fell on ships similar to those which had been used during the War of Independence, and were already in existence when the

new war began. At that time the navies consisted of—

British.	*French.*
5 of 100 guns.	3 of 120 guns.
16 " 90 to 98 guns.	5 " 110 "
1 " 80 guns.	10 " 80 "
61 " 74 "	62 " 74 "
30 " 64 "	—
—	80
113	

The French three-deckers of 120 and 110 guns were superior to the British 100-gun ships; their 80's were fully a match for the 98's; while their 74's were more powerful than the corresponding British ships, which were mostly of the smaller 18-pounder class. The law of equality did not produce its full result until after the peace in 1815, when the several classes of ships in the two navies became not only nearly equal in fighting power, but similar. As yet they were neither equal nor similar, and, as in the Seven Years' War, the British numerical superiority was pitted against the individual superiority of the French ships. The victories of the Nile and Trafalgar taught the same lesson as Quiberon and Dominica, that tactics count more than any moderate difference in the individual power of the ships engaged. The main strength of each navy was formed of ships moderate in size: the proportion of 80-

gun ships and above being nearly the same—19 and 22 per cent respectively. Hence, whether it be from the days of Benbow or of Nelson, we are to draw the same conclusion, that war brings about a distribution of fighting power alike on both sides, and that the ships or instruments of war tend to become similar and equal.

We have now to determine the reasons why fighting power in the sailing navy was distributed between ships of different sizes—why the greater number of capital ships were of moderate size and force, and only a small proportion of exceptionally large tonnage and power. It has been shown that during the closing years of the eighteenth century financial reasons somewhat favoured the 74-gun ship, but the preference for ships of moderate size is believed not to have rested on cost but on military necessities. Neither seaworthiness nor speed can have exerted a predominant influence, because the proportion of three-deckers was a maximum in both the British and French navies when these ships were the least seaworthy. When these ships had been so much improved as to be able to keep the sea during the winter months less reliance was placed on them. The proportion of British ships carrying 80 guns

and upwards fell from 45 per cent at Malaga to 14 per cent at Dominica, and of French ships in the same actions from 31 per cent to 20 per cent. Again, the British continued to use 98-gun three-deckers as flagships, notwithstanding their relatively poor weatherly qualities, which must have impaired the mobility of their fleets as a whole. On the other hand, the French did not restrict themselves to 80-gun ships, although D'Estaing reported that his flagship the *Languedoc*, and her sister the *Tonnant* of 80 guns, were the best sailing ships in the fleet, and that the first was faster even than the frigates. Evidently the British retained the 98's because a certain concentration of force beyond that of the 74 was necessary, and the French held to the latter because a distribution of force beyond that of the 80-gun ship was required. What were the military necessities which forced both sides to act alike?

They are not far to seek, and are to be found in the nature of the work that had to be done. This varied little throughout the wars of the eighteenth century. The enemies' fleets had to be defeated, and the secondary services had to be provided for. The first required concentration, the second distribution of force. The heaviest ships were found in the great fleets,

where, as flagships stationed in the centre of each division, they were powerful units in the Admiral's hands readily available for use at decisive points. They also provided the accommodation indispensable for the staff of an admiral charged with the conduct of great operations. The ships of moderate size were at times massed in large fleets, but were as frequently broken up into detachments of various sizes, depending upon the nature of the service required. The secondary services which from time to time called for a distribution varied greatly. At one time the control of the Indian seas is at stake, and both sides reinforce their squadrons in those waters. Two-decked ships are found most suitable for such a distant service. At another a force is required in the North Sea to face the Dutch squadron, while the main British force is fully occupied with the fleets of France and Spain. The smaller ships of the line are sufficient for the purpose, are more suitable than larger ships, and by using them the main fleets are not materially weakened. Or an escort has to be provided for a military expedition to capture an enemy's base, such as that which took possession of the island of Minorca in the year 1798, when two 74-gun ships were sufficient. But the work which called chiefly for distribu-

tion of force in the past, and probably will again in the future, was the protection of the trade. The convoy service absorbed a considerable number of the smaller ships of the line. Ships no longer equal to taking their places in the main fleets were found suitable, and were largely used. The military reasons for convoy are believed to be as valid now as ever they were. Should the system again be used, it may be that ships now considered of little value will be found capable of much useful service.

The result of our study of the sailing navy has shown that strategical and tactical requirements governed the growth of the capital ship or ship of the line; that to meet the demands of enduring mobility her size gradually increased, until her "space capacity" approximated to about 9000 nautical miles; that the work to be done called for a large number of ships of moderate dimensions, and a small number of exceptional power, and that her final size was determined by the military necessity of making each class of ship not very different in fighting power from the corresponding ships of the enemy.

To what extent has the growth of the steam navy followed the same lines? The intermediate

stage during which ships were fitted with both sails and engines need not detain us, as it was not illuminated by war experience of any value. The true steam navy began with the ships dependent on steam alone. These were the so-called coast-defence ships of the American War of Secession and of the seventh decade in the last century: their enduring mobility was hardly on a par with that of the Elizabethan ships, and was represented by a "space capacity" of less than 2000 nautical miles. They were as much tied to their bases as were Robinson Crusoe and Howard of Effingham to their islands.

In the year 1869 was laid down in Great Britain the *Devastation*, which represented a great advance and embodied a much truer conception of strategical necessities: her "space capacity" may have approached 5000 nautical miles, or about the same as ships in the time of Blake and Penn, two centuries earlier. But in the ships which followed, such as the British *Inflexible* and *Ajax* and the French *Duperré* and *Amiral Baudin*, the "space capacity" fell again to less than 3000 nautical miles. It was not until the year 1880 that the importance of enduring mobility in the operations of war began to appeal to the naval mind. In that year was laid down in Great Britain the first of the

"Admiral" class, with a "space capacity" of about 4000 miles. These were followed in the year 1889 by the *Royal Sovereign*, with 5000, and in the year 1893 by the *Majestic*, with about 6500 nautical miles. France lagged behind: she did not approach 4000 miles until the year 1894, when the *Charlemagne* was laid down, and it was 1902 before she commenced the *République*, in which the "space capacity" is claimed to be 8400, but is more probably about 6000 nautical miles. The latest battleships and armoured cruisers, with the aid of oil fuel, are approaching the 9000 miles "space capacity" of the sailing ship of the line. Like causes produce like effects. The demands for enduring mobility are governed by the geographical conditions, by the distances which have to be traversed. These last are the same now as they were during the sailing era, and accordingly the demands are still the same. As the "space capacity" of the modern battleship approaches that of the sailing ship of the line, we may reasonably infer that the increase in the size of the former from this cause is nearing its limit. The gradual increase in displacement, coal stowage, and "space capacity" is shown in the following table:—

	Date laid down.	Ship.	Displacement.	Coal carried. Normal. / Full stowage.	Space capacity.
			tons	tons	knots
British.	1869	Devastation .	9300	1350	5000
	1874	Inflexible . .	11,880 / ...	1200 / 1300	... / 2500
	1880	Collingwood .	9500 / ...	900 / 1200	... / 4000
	1889	Royal Sovereign	14,150 / ...	900 / 1450	... / 5000
	1894	Majestic . .	14,900 / ...	900 / 2000	... / 6500
	1903	Duke of Edinburgh . .	13,550 / ...	1000 / 2100	... / 9000*
	1904	Lord Nelson .	16,500 / ...	900 / 2000	... / 8500*
French.	1876	Duperré . .	11,030	780	2200
	1894	Charlemagne .	11,108	1080	4000
	1902	République .	14,630 / ...	890 / 1800	... / 6000
	1904	Ernest Renan .	14,420 / ...	1210 / 2210	... / 7500
American.	1901	West Virginia.	15,140	2000	7000
	1903	Connecticut .	17,600	2200	7000

* Including an allowance for oil carried in double bottoms.

In a generation the "space capacity" of the steaming capital ship increased to the limit reached by the sailing navy after two centuries of effort.

The growth in displacement brought about

by the demand for increased fighting power is shown in the following table :—

Date laid down.	Ship.	Displacement.	Weight of			Cost, excluding armament.
			Broadside.	Armament.	Armoured protection.	
		tons		tons	tons	
1869	Devastation .	9,300	4 of 714 lb.	515	2900	£361,438
1874	Inflexible .	11,880	4 " 1700 "	820	3540	795,000
1880	Collingwood	9,500	4 " 714 " / 3 " 100 "	660	2730	637,000
1889	Royal Sovereign	14,150	4 " 1250 " / 5 " 100 "	1410	4550	770,179
1894	Majestic . .	14,900	4 " 850 " / 6 " 100 "	1580	4585	838,831
1902	Edward VII.	16,350	4 " 850 " / 2 " 380 " / 5 " 100 "	2575	4175	1,383,000
1905	Dreadnought	...	8 " 850 "	...	...	1,684,000

Neither armaments nor protection at different epochs are directly comparable, since both weapons and armour have changed, but their influence on increase in size is seen. For similar reasons the weights of broadside must not be directly compared. The enormous proportion of the displacement absorbed by inert defensive armour merits particular notice, in view of the fact that ships can be defeated without perforating it. As fighting power should not be sacrificed to speed in the capital ships, so also gun power should not give way to armour. The best defence is a vigorous offence, and therefore the weapon which plays the double *rôle* of striking, and thus preventing a return blow, must never be sacrificed to the inert plate which

feebly suffers without reply. It is believed that too much stress is now laid on speed and protection, and too little reliance placed on gun power and tactical skill.

The law of equality has governed the shipbuilding during the last five years, as is shown in the following table:—

Year laid down.	Ship.	Nation.	Total displacement fully loaded.	Broadside.
			tons	
1901	Queen . . .	Britain	16,000	4 of 850 lb. 6 " 100 "
1901	Braunschweig .	Germany	14,000	4 " 595 " 7 " 154 "
1901	Georgia . . .	America	16,300	4 " 850 " 6 " 250 " 6 " 100 "
1902	République . .	France	15,500	4 " 644 " 9 " 115 "
1902	Edward VII. .	Britain	17,400	4 " 850 " 2 " 380 " 5 " 100 "
1903	Connecticut .	America	17,600	4 " 850 " 4 " 250 " 6 " 165 "
1904	Lord Nelson .	Britain	17,600	4 " 850 " 5 " 380 "
1905	Dreadnought .	Britain	19,700	8 " 850 "
1907	Danton . . .	France	19,000?	4 " 750 " 6 " 317 "

The advent of the British *Dreadnought* has brought about a corresponding rise in the size of the battleships in all first-class navies. These facts afford conclusive evidence that it is futile to aim at building ships more than equal in power to those of other nations. This being

the case, is it a wise policy on the part of Great Britain to lead the way in increasing the size? Larger ships mean greatly increased cost, not only for the ships themselves but for building-slips and docks, as is evidenced by the works undertaken or to be undertaken. It was not her policy at a time when her supremacy at sea was won—when the seamen who directed her councils were experienced warriors. It is the policy of men who have no practical war experience, and not having studied history are not familiar with its leading principles. They seem neither to realise that up to now increase of size has been justified by the demands for greater enduring mobility and for some increase in fighting power, nor to understand that a point has been reached when tactical and strategical requirements point to distribution rather than to a further concentration of fighting power. They have appealed for support to the ignorant public, but the trained professional judgment will eventually decide. In doing so, the Navy will remember that numbers are strategically necessary to meet the many demands of British interests; that, as in the past, the secondary services in war will require capital ships of moderate dimensions, and that it will be uneconomical of fighting power, and indeed strategically quite unsound, to weaken

the main fleets by detaching a *King Edward VII.*, of 16,358 tons and costing £1,383,000, to perform a service which can be equally well done by a *Triumph* of 11,800 tons, and valued at £833,000. This doctrine is already partially admitted in practice. At this very time is being developed for a secondary service an inferior class of capital ships, moderate in fighting power but excessively costly. This is the so-called armoured cruiser, of which particulars are given in the following table :—

Date laid down.	Ship.	Nation.	Displacement.	Number of crew.	Weight of			Cost, excluding armament.
					Broadside.	Armament.	Armoured protection.	
					lb.	tons	tons	£
1899	Drake	Britain	14,100	813	2 of 380 8 " 100	900	3000	1,000,000
1901	West Virginia	America	13,680	820	4 " 250 7 " 100	840	2200	1,090,000
1903	Duke of Edinburgh	Britain	13,550	760	4 " 380 5 " 100	...	...	1,071,000
1903	Tennessee	America	14,500	820	4 " 500 7 " 100	869	2629	1,200,000
1904	Edgar Quinet	France	13,420	674	2 " 317 6 " 115	...	...	1,247,000
1905	Minotaur	Britain	14,600	770	4 " 380 5 " 200	...	...	1,330,000

Again the law of equality is seen at work. The original ships of the class were comparatively small and cheap, but under the foolish and unscientific policy of "going one better" they have gradually grown until their size and cost have been trebled. Their distinguishing characteristic is the sacrifice of fighting power

to speed, which in the later ships is about 22 or 23 knots. Finality has not yet been reached, as the new cruisers of the *Invincible* class are still larger, faster, and more costly. Their cost will approach that of the *Dreadnought*. Will they satisfy tactical and strategical necessities? Will they be in accord with the principles underlying the conduct of war?

We are to remember that these nominal cruisers are really capital ships, and as such will be massed in fleets with the battleships. The *Drake* and *West Virginia* are each as costly as the battleship *Russell*, are of about the same displacement—14,000 tons—but carry larger crews. Their broadsides are 1560 lb. and 1700 lb. respectively, against the *Russell's* 4000 lb., and their protection is much inferior. What chance will the 800 men of the *Drake* or *West Virginia* stand against the 750 of the *Russell*, with her superior fighting power? The *Tennessee* and *Minotaur* approach the cost of the *King Edward VII.*; what will either be able to do against the crushing weight of her broadside, which is nearly double their own? Neither of them will even be a match for the cheaper *Russell*. When it comes to battle their superior speed will not avail them. We maintain, with the late Admiral Colomb, that the only tactical advantage of superior speed is that

the ship possessing it can run away. That it will confer an advantage if the enemy flees is true, but this argument is based on the fallacy that the enemy will turn tail. Why is it assumed that the slower side, with necessarily superior fighting power, will flee and be unwilling to fight? Why should a squadron of *Edward VII.'s* or of *Dreadnoughts* not wish to fight an equal number of *Minotaurs* or *Invincibles?* It is not the former but the latter who will be doubtful of the result, and will wish to run away. These last will be obliged either to accept battle at a disadvantage, or to withdraw altogether from the sphere of operations, leaving their interests entirely at the mercy of the enemy. That squadrons cannot always withdraw, but are irresistibly attracted toward the decisive point and forced to fight, has been lately shown in the cases of Admirals Cervera and Rojdesvenski. If the faster but weaker side is to fight with a fair prospect of success, the number of *Minotaurs* or *Invincibles* must be increased, until their aggregate fighting power becomes nearly equal to that of the enemy. This means greatly increased cost, because the faster weak units are as costly as the slower strong ones. To give some idea of the extra expense involved, it may be stated that to make the broadsides equal in number

of guns, six *Minotaurs* must be provided to meet five *Edward VII.'s*, the extra charge being £1,330,000. But the *Minotaur's* guns are smaller, and her protection is weaker. To make the fighting power approach equality, at the very least seven *Minotaurs* must be built, the additional cost being £2,660,000. These sums do not include the extra charge for the armaments and upkeep of the additional ships and crews. Precisely the same reasoning is applicable to the *Invincibles* and *Dreadnoughts*, but in their case the increased charge would probably be greater.

Our views will be best summed up by reference to the Naval Defence Act of the year 1889. The great advance embodied in the ships built under that Act was similar to that initiated in the sailing navy one hundred and forty years before. In both cases the ships were made larger to increase their enduring mobility, their seaworthiness, and their fighting power. That great Act showed a correct perception of the true principles underlying war at sea. It provided capital ships and cruisers—the first to decide the great battles, the second to seek intelligence, keep open the lines of communication, and protect the trade. It recognised the principles evolved by the experience of the sailing navy,

that the work to be done requires capital ships of the same enduring mobility but of different fighting power; it departed from those principles in assigning different speeds to the two classes of capital ships, which, as they were to act together, was a mistake. The weight, which was absorbed in increasing the speed of the smaller ship, should have been allotted to additional gun power. It accepted the principle that in the cruiser, numbers, enduring mobility, and speed are of more importance than fighting power, and that, therefore, they should be as small and cheap as is compatible with the work to be done. The cruisers were ultimately given a "space capacity" approximately equal to that of the sailing frigate, and a speed rather higher than that of the battleship. The designs of the battleships built under the Act were laid before Parliament, and the Board of Admiralty reported that a number of flag-officers had been specially summoned to meet their lordships and consider them. The parliamentary paper states that the general opinion of that meeting was that the speeds given "were sufficient, in view of the considerable increase in size and cost involved in obtaining higher speeds; and that it would be preferred, with a given expenditure, to have a larger number of vessels possessing these speeds rather than one or two vessels of

higher speed." In other words, it was held that fighting power should not be sacrificed to speed.

The policy has now been entirely changed. The principles of the Naval Defence Act and of the sailing navy have been "scrapped." The experience of generations of seamen has been discarded and declared to be wrong. None but battleships, ever increasing in size and cost, are in favour, quite regardless of the varying nature of the work to be done. None but cruisers as large and costly as battleships are building. These are capital ships in which fighting power is sacrificed to speed, contrary to the principle laid down in the year 1889. Their numbers must necessarily be small and they must be kept concentrated, thus leaving the trade open to attack by small ships, as happened to the American shipping during the Civil War. But this idea of trusting to great size, and of sacrificing fighting power to speed, has a much graver aspect. If men are continually told that large ships are all-important, their ideals cannot fail to be influenced. They will come to think that victory depends upon size alone, and will forget that superior skill and a lofty spirit are far more important. To teach reliance on superior *matériel* is to encourage neglect to acquire skill. The ideas underlying the ship big enough to "lick creation," as well as those embodied in the ship

fast enough to run away, lead not to great deeds, but straight to "regrettable incidents." As the Aldershot field-day is believed to have laid the foundation of the South African surrenders, so manœuvres, when ill-conceived, may teach the navy to favour ships suitable for running away. The policy of the *Matériel* School is entirely opposed to the principles and practice of our forefathers, who owed their success not to any superiority in the size and speed of their ships, but to their own skill and valour. Bad will be the day for Britain when her Navy falls away from their great traditions.

IX.

THE SPEED OF THE CAPITAL SHIP.[1]

THE question of mobility is one of the most difficult and complex among those which beset the naval strategist, tactician, and ship designer. The word "mobility" means capacity of being moved, and the term "enduring mobility" is used to denote the sea-keeping capacity of a ship, which includes capacity both as to time and space—the distance which can be traversed as well as the length of time in motion. Mobility must not be confounded with speed, which has a more narrow signification, and means rapidity of motion. Previous to May 1905, when 'Blackwood' began to throw doubts on the value of superior speed, the complex nature of the mobility problem was unheeded, and among the unthinking no phrase was more common than "speed is everything." The necessity for high speed was then looked upon as an axiom requiring no demonstration, and was

[1] Blackwood's Magazine, October 1906.

generally believed to involve no sacrifice. Time and reflection have since brought doubts to many, who may now welcome a more comprehensive discussion of the question than has been hitherto expedient.

The first ocean-going battleship dependent on steam alone as the propelling power was launched in 1871. This was the *Devastation*. She was endowed with an enduring mobility equal to rather more than half that of the sailing-ship of the line. Since that date the extreme speed given to the battleship has gradually increased from 13·8 knots in the *Devastation* to 17·5 knots in the *Prince George* launched in 1895, to 18·5 knots in the *Edward VII.* launched in 1903, and even to 21 knots in the *Dreadnought*. How has this increase been brought about?

The answer is to be found by comparing the *Prince George* with the *Devastation*, launched respectively in the years 1895 and 1871. The data for the two ships as designed are—

	Length.	Breadth.	$\frac{\text{Length.}}{\text{Breadth.}}$	Mean draught.	Displacement.	Indicated horse-power.	I.H.-P. per ton of displacement.	Speed.
	feet	feet		feet	tons			knots
Devastation .	285	62½	$\frac{4·6}{1}$	26⅜	9,060	5,600	·62	12·5
Prince George	390	75	$\frac{5·2}{1}$	27½	14,900	12,000	·8	17·5

The *Devastation* was not completed in accordance with her original design, and the facts given above for the *Prince George* represent her condition when carrying only 900 tons of coal, or 1100 tons short of her complete stowage. For our purpose the data relating to the completed *Devastation* and the fully loaded *Prince George* are required.

They are—

	Length.	Breadth.	Length. / Breadth.	Mean draught.	Displacement.	Indicated horse-power.	I.H.-P. per ton of displacement.	Speed.
	feet	feet		feet	tons			knots
Devastation as completed	285	62½	4·6 / 1	26 8/12	9,300	6,600	·71	13·8
Prince George fully loaded	390	75	5·2 / 1	29 2/12	16,000	12,000	·75	17·2 estimated

The speed shows an increase from 13·8 to 17·2 knots, or 24 per cent. Only a small proportion of this large increment can be accounted for by the small addition to the horse-power per ton of displacement, which is only 5 per cent. The greater part must be due to other differences between the two ships. These are increased size or displacement, greater proportion of length to breadth and to mean draught, and improved form. To the increase in size from 9300 to 16,000 tons must be credited a portion of the additional speed. A

ship having the same displacement and horse-power as the *Prince George*, but similar in form and proportions to the *Devastation*, might be expected to attain a speed of about 15 knots, which would mean a gain due to size alone of more than 1 knot. The remainder of the increase in speed must be due to improved form. A ship having the same displacement and horse-power as the completed *Devastation*, but similar in form and proportions to the *Prince George*, might be expected to approach a speed of 16 knots, which would be a substantial gain over the 13·8 knots actually attained by the first-named ship.

It is to be noted that the *Prince George's* gain in speed involved no sacrifice in other directions. The improvements in her form and proportions were the result of wider and more accurate knowledge of the laws governing steamship propulsion and the resistance offered to the motion of ships. Her growth in size was brought about largely by nautical and military necessities. The nautical need was to improve the sea-keeping qualities, which meant higher free-board and involved increased weight of hull. The military demands were strategical — for greater enduring mobility, which entailed a larger coal-supply; and tactical — for greater fighting power, which meant increased weight

of armament and equipment. The additions required to the weights of hull, coals, armament, and equipment reacted not only on each other, but also on those allotted to machinery and protection. Each addition meant increased displacement, and involved a further rise all round to provide for the larger ship. Thus the weight added to make the hull higher carried with it further additions to make it larger, and to provide the increased engine-power, coals, and protection required. The additions necessary were largely discounted by taking advantage of the improvements in shipbuilding material, in steam machinery, and in armour. These points are best understood by comparing the weights allotted to the different elements in the two ships as shown in the following table :—

	Devastation as completed.		Prince George fully loaded.		Percentage difference in Prince George.	
	tons	percentage	tons	percentage	increase	decrease
Equipment.	316	3·4	700	4·4	1·0	...
Armament.	515	5·5	1580	9·9	4·4	...
Machinery.	1064	11·5	1330	8·3	...	3·2
Coal . . .	1350	14·5	2000	12·5	...	2·0
Protection.	3415	36·7	4540	28·4	...	8·3
Hull . . .	2640	28·3	5850	36·5	8·2	...
	9300	99·9	16,000	100·0	13·6	13·5

Here is seen not only a large absolute addition to the weights of hull, armament, and equipment, but a larger percentage of displacement allotted to them. On the other hand, although the absolute weights given to machinery, coal, and protection are higher, they absorb a smaller proportion of the displacement. The additional percentage required for the hull is almost exactly balanced by a saving in that applied to protection. The armament is increased at the expense of mobility, and the proportion allotted to it is made equal to that in the sailing 74-gun ship during the later Georgian era.

The increase in speed during the last thirty-five years has been a natural growth in those capital ships where, as in the *Prince George*, it has been attained without the sacrifice of fighting power. Such ships are true battleships. The growth has been unnatural where fighting power has been sacrificed, as in the so-called armoured cruiser. As has been already explained, the natural growth in speed has been due, firstly, to improved form and proportions; secondly, to a small additional ratio of engine power to displacement; and thirdly, to increased size. The laws governing steamship propulsion have been so closely examined during the past generation, and they are now so well understood and applied, that but little further growth is to be

expected from the first cause. Future improvements in materials and machinery may make it possible to increase the engine power and the speed without adding to the weight. The enduring mobility of the latest capital ship has reached the limit found sufficient in the sailing-ship of the line. The "space capacity" of the *Lord Nelson* has been estimated as about 8500 sea miles, while that of the *Dreadnought* has been given officially as 5800 sea miles, without taking into account the oil-fuel stowed, which will probably raise it above 8000 miles. Hence it is not probable that further large inroads on the displacement will be made by enduring mobility. Any future increase in size will be due to demands either for greater fighting power or for increased speed, or for both. Will these demands be justified? As already explained in Article VIII., where the growth of the capital ship is discussed, the proportion of fighting power to be concentrated in any one ship is a military question, and is mainly dependent upon the work to be done. To meet the demands of war, the sailing era saw fighting power divided between a large number of capital ships moderate in size and a small percentage exceptional in power. It is held that future wars will make the same calls on steam navies.

The validity of the demands for increased speed remains to be examined. This also is a military question, and turns upon the tactical and strategical advantages of superior speed. As the military work to be done tends to restrict the size of the capital ship to moderate dimensions, it is evident that the military value attaching to superior speed is a prime factor in determining both size and cost. If all other things were equal, superior speed would be undoubtedly of some value both tactically and strategically. But all other things are not equal, since superior speed cannot be obtained without the sacrifice of some other element in a ship of war. Before determining on the sacrifice, it is well to know as precisely as possible the value of superior speed. The tactical advantages most often claimed for it are that it is the equivalent of the "weather gage" in the sailing era, that after the battle is won it is useful in the pursuit, and that he who has it can fight at the range he prefers. Not one of these claims is entirely correct. It is true that superior speed often confers power to give and refuse battle, as did the "weather gage" to somewhat the same limited extent. But the faster fleet has not now the choice of the method of attack, and the slower one is not limited to a defensive attitude, which shows

how little real analogy exists. It is also true that superior speed is useful in the pursuit, but it is not necessary to sacrifice fighting power to obtain a margin for this purpose, and it is not expedient to do so, because the enemy must be beaten before he is pursued. If all capital ships were built equal in speed, it is well known that under service conditions some would be faster than others. This natural selection meets now, as it did in the past, all the requirements of the case.

Whether superior speed controls the range depends upon the relation between the courses and speeds of two ships manœuvring at a constant distance apart.

Fig. 1.

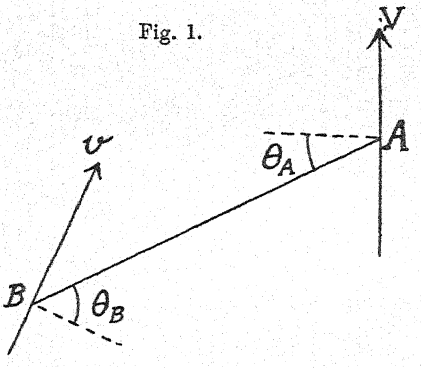


Fig. 1 is intended to illustrate this relation, which is given by the equation—

$$\frac{\text{Sin } \theta_A}{\text{Sin } \theta_B} = \frac{v}{V}$$

where V, v are the speeds of two ships A and B steering any two courses, as shown in fig. 1, θ_A, the bearing of B abaft (or before) the beam of A, and θ_B the bearing of A before (or abaft) the beam of B. It is clear that if A wishes to alter the range, he will bring B abaft or before his beam according as he wants to open or close. We have to show that if B desires to keep the range constant, he can frustrate A's attempt within certain limits, by steering suitable courses, given by the above equation. This formula is the key to a right understanding of the value of superior speed in controlling the range. The proof of it is given in an appendix.

The values of θ_A and θ_B corresponding to the ratio $\frac{V}{v}=\frac{7}{6}$ have been calculated, and are as follows :—

$$\theta_A = 0^\circ,\ 25^\circ,\ 30^\circ,\ 37^\circ,\ 48^\circ,\ 59^\circ$$
$$\theta_B = 0^\circ,\ 30^\circ,\ 36^\circ,\ 45^\circ,\ 60^\circ,\ 90^\circ$$

These results mean that when $\theta_A = \theta_B = 0$, the two ships are moving round a-beam of each other on concentric circles, and the range or distance between them remains constant. If A, wishing to open out from B, sheers away (fig. 1) and brings her to bear any number of degrees up to 59 abaft the beam, B can frustrate the attempt by steering towards A and bringing her

to bear the corresponding number of degrees before the beam up to 90, when B will be heading straight for A. If A sheers away more than 59 degrees, then B can no longer prevent her opening out. Precisely the same results will obtain if A wishes to close, except that she will turn towards B, who will edge away and will be able to prevent any change of range until A turns more than 59 degrees, when B will be steering straight from A and will be unable to prevent that ship closing. Hence within a certain value of θ_A dependent upon the speed ratio, superior speed gives no power to alter the range. Outside this "limiting bearing" the faster ship controls the range, which means that she does so when one or the other tries to open out, withdraw, or run away. The value of the "limiting bearing" in degrees at various speeds is as follows:—

Speed of faster ship. Knots.	Excess of speed. 1.	2.	3.	4.
21	72	65	59	54
18	71	63	56	51
15	69	60	53	47

It will be remembered that the corresponding value for θ_B is always 90 degrees. We have to note that the higher the speed the larger is the "limiting bearing," and also the greater the excess of speed required for a given "limiting

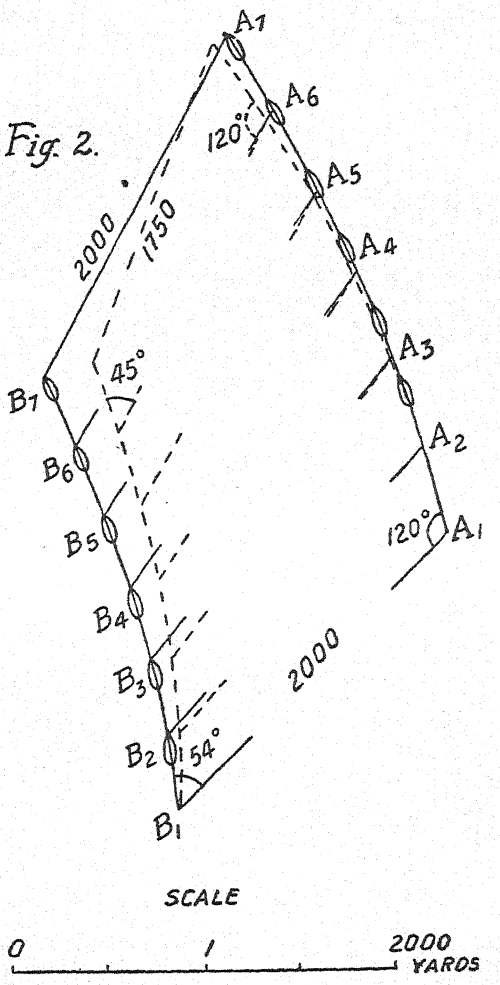
bearing." Hence such advantage as is given by superior speed decreases as the speed rises.

But the maximum bearing or angle on which all the guns on one side can be concentrated varies from about 45 degrees before or abaft the beam bearing in battleships of the latest types to 30 degrees, or even 25 degrees, in other such ships, and from about 60 degrees in armoured cruisers of the latest designs to 30 degrees in others of the class. Consequently, as the ships turn in the manner already described, the broadside guns, and possibly others, go out of action in one or both ships before the "limiting bearing" is reached. The ships cease to be on an equality at an earlier stage. In fact, the "limiting bearing," which marks the point where one ship begins to control the range, is dependent not only on the relative speeds but on the arcs through which the guns train. The necessity of using as many guns as possible gives the control of the range not necessarily to the faster ship, but to the one which can keep them longest in action. The faster ship will be able to do so unless the guns of the slower train through arcs wider than those due to the speed ratio. Thus, if the guns of the faster ship train 30 degrees while those of the slower train 45 degrees, so long as all the guns are in action the latter

will control the range when the ratio is $\frac{7}{6}$, but neither will do so when the ratio is $\frac{7}{5}$, since θ_B will then equal 44 degrees when θ_A equals 30 degrees. Between these limits lie the data applicable to the Japanese and Russian battleships which took part in the battle of Tsu Sima. The wider arcs of training more than compensated the Russians for their deficiency in speed, and would have prevented the Japanese controlling the range but for their overpowering gun-fire and superior tactics, which enabled them to do so.

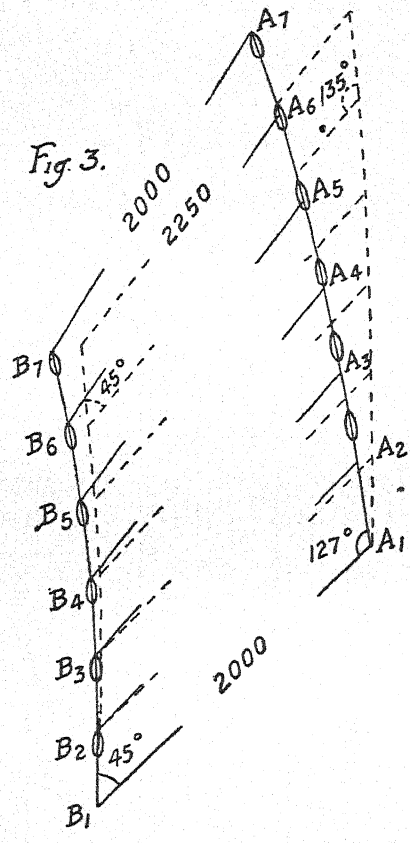
This point can be better understood by reference to fig. 2, in which are plotted to scale the successive positions A_1, A_2, A_3, B_1, B_2, B_3, at one minute intervals of two ships whose speeds are 14 knots and 12 knots, and whose guns can be trained 30 degrees and 45 degrees from the beam bearing respectively. On the same diagram are shown the relative positions of two squadrons, of which A_7 and B_7 are the leaders. We now deal only with single ships. A wishes to open out from B, and keeps him 30 degrees abaft the beam; B intends to maintain the range constant, and holds A 36 degrees before the beam. A, the faster, cannot open out without throwing his broadside guns out of action, and in fact running away. On the other hand, B can close while all the guns of both ships are

in action, by keeping A 45 degrees before the beam, as is shown by the dotted lines. The



range decreases at the rate of about 42 yards a minute—of one mile in 50 minutes.

Fig. 3 illustrates the case when the guns of both ships train 45 degrees. The solid lines represent their paths when the range is con-



stant, and the dotted lines those when A opens out against the will of B, with all the guns of both ships just bearing. The maximum rates

at which he can do this under various conditions are as follows:—

Difference of speed.	Angles of training of guns in degrees.		
	60	45	30
	Yards per minute.		
1.	29	23	17
2.	58	46	34
3.	86	70	50
4.	116	92	68

The rate is so slow that it is evident if two ships approach each other to engage, the time selected to turn for the purpose of bringing the broadside guns into action rather than the power to open or close determines the range at which the battle is fought. So far as single-ship actions are concerned, superior speed does not govern the range on opening fire, and, unless one side runs away, only controls it during the fighting when associated with sufficiently wide arcs of training the guns, and then only to a limited extent. Whichever ship has this power to control must, in order to use it, bring her enemy to bear on her quarter or bow, according as she wishes to open or close. If she is the leader of a squadron, the effect is to

expose the van of one side and the rear of the other to a concentrated attack. This is evident from the diagrams. When the two fleets are in this position, unless the guns of the slower have considerably wider arcs of training, the faster will have some advantage if he wishes to keep outside any given range. This advantage decreases as the range increases, because the lines become less curved. But, as in the case of single ships, it is getting into position which really determines the range, and we are to remember that with speeds differing only two or three knots, if a good position is not taken when the battle begins much time will be needed to move into it, during which the guns will be at work largely discounting its value. Both the sham fight off the Azores in the year 1903 and the battle of Tsu Sima showed that difference of speed is less important than tactical skill when taking position. Although the foregoing arguments are not put forward as exhaustive, they are perhaps sufficient to convince the reader that proof of the tactical advantages due to superior speed should be forthcoming before fighting power is sacrificed to obtain it. We continue to insist that tactical experiments should be made to determine its value.

The strategical value of superior speed cannot be understood without a wide and comprehensive knowledge of the art of conducting war, which few possess. This art cannot be fully discussed in a short article; but its leading principles may, perhaps, be made clear enough to show that the wide difference of opinion as to the value of superior speed is due to imperfect knowledge.

War is a struggle between organised national forces, and is decided ultimately by their use in battle. The distribution and movements of these forces determine when and where these fights shall take place, and the strength of the combatants in each action. It is the province of strategy to deal with the principles involved in making these arrangements — to determine when and where fighting power shall be transferred. Every war is waged with a view to attain some special object, and involves, or should involve, a general plan which controls to a greater or less degree the movements of the hostile forces. To attain the object, it is usually found necessary to control one or more particular water areas, which must be provided for in the plan. Thus, the control of American waters was vital to success both in the War of Independence during the eighteenth century and in the Civil War about eighty years later. The result of the Napoleonic wars turned on

the control of European waters, and the recent Japanese successes were dependent upon keeping the mastery of the Japan Sea.

When viewed as mobility problems, these examples present themselves under two broad aspects. We have to consider, first, the principles which govern the transfer of force from area to area; and second, those which control its use within any given area. In the first case, the aim is to possess superior fighting power in a particular area. This can be realised either directly by sending a force there, or indirectly by threatening some other point with a view to prevent the enemy despatching reinforcements, or to tempt him to break up the force he already has there. The direct method was used in the year 1778, when D'Estaing's appearance off Sandy Hook gave the French superiority in American waters until the arrival of Byron from England. The indirect plan was applied during the great French war in the form of prevention by Great Britain in her system of blockades, in the shape of temptation by Napoleon during the Trafalgar campaign, when he sent Villeneuve to the West Indies. Whether the plan is that of D'Estaing or that of Napoleon, the opposite side must take steps to counteract it, and they immediately ask, Where shall we go? When shall we start?

When can we arrive—*i.e.*, at what speed can the passage be made? Of these the destination and the decision to start are by far the most important, and are the governing factors. They are dependent upon the general plan, upon accurate intelligence relative to the enemy's movements, and upon a correct judgment of his aims and intentions. They give scope not only for great mistakes, but also for the incalculable inspirations of genius.

This view is supported by history, the best known case being Nelson's pursuit of Villeneuve to the West Indies. Nelson arrived in the West Indies sixty-six days after the French left Toulon, and twenty-one days after they reached Martinique. He was detained awaiting news nineteen days off Sardinia and Sicily and two days at Lagos, or twenty-one days in all. If the stay at Lagos is allowed for, he took the same time—forty-five days—to reach the West Indies from the position where he first decided to start west as Villeneuve took from Toulon. The distances were nearly equal. The longer passage down the Mediterranean was balanced by the shorter one across the Atlantic. Whatever superiority in speed their greater skill may have given the British squadron, it could not be expected to balance twenty-one days' detention: it was made void by false intelli-

gence in the West Indies, and by uncertainty as to the destination of the enemy on their return to Europe. The time of arrival in the new area is dependent less on the actual speed of the ships than on intelligence relative to the enemy, and on the judgment of the admiral. The uncertainty on these points is believed to have exceeded those due to the wind in the days of sail, and to be still the dominant factor. Unfortunately, peace manœuvres are often so designed that the position of the ships, the time when they will start, and their destination, are so little in doubt that the whole operation is made to turn on speed, and undue prominence is given to this factor. Opinion is misled.

Again, in these days of steam the maximum speed is no measure of that at which a passage can be made. A much lower one is imposed by the necessity to economise fuel for the purpose not only of providing for the voyage, but also of ensuring a sufficient reserve when about to come in contact with an enemy. Enduring mobility is of more importance than high speed. It is a noteworthy fact that the Russian squadron under Rojdesvenski, afterwards destroyed at the battle of Tsu Sima, made the passage from Tangier to the Cape, a distance of 5100 miles, in forty-four days,—that is, at an average speed of 116 miles a day, which is little above the rate

at which sailing-ships of the line made their passages. In these transfers of force it is of as much, if not more, importance to arrive with the fighting power intact as it is to make a quick passage, which means that no ship must be left behind, and the speed must be that of the slowest ship. How little heed is paid to this during peace manœuvres when no real fighting is in prospect!

In the second case, we have to remember that the aim in placing a fighting force in a given area is to destroy, contain, or drive away the enemy's fighting force in that area, and thus to command it,—that is, to leave it free to the ships of the one side and to deny it to those of the other. This command is required with a view to some ulterior object, such as the prosecution or prevention of some military operation which forms part of the general plan, or the control of the over-sea trade upon which the wealth of a nation so largely depends. Thus, the command of American waters was a very important factor in the operations of the army during the War of Independence, and the object of Napoleon in the Trafalgar campaign was the invasion of England. In both cases the movements of the fleets were largely governed by the requirements of the actual or proposed operations on land. On the other hand, in the seventeenth century the

Dutch wars were largely due to commercial rivalry, and were purely maritime, so far as concerned Great Britain. The struggle was for naval supremacy, with a view to the control of the carrying trade. Ultimately the two navies were concentrated in the North Sea, and were moved without reference to any object other than the command of the sea.

The control of a water area cannot be acquired without fighting or being prepared to fight. If both sides are determined, each will be compelled to concentrate his capital ships, and will be drawn towards the central strategic point. The two will come into collision. The Dutch wars offer a striking example of a struggle for the command of a limited area. They gradually, but finally, impressed on both sides the necessity for concentration and the supreme importance of fighting power in the capital ship. Again, in the year 1781, during the American War of Independence, the military situation in Chesapeake Bay attracted first Arbuthnot and Destouches, and later De Grasse from the West Indies, De Barras from Newport, and Graves from New York. In each case an action took place, and, finally, the great superiority of the French in fighting power led to the withdrawal of the British and the surrender of Cornwallis. Here the important point was not speed, but fighting

power. Seeing that Cornwallis did not surrender until six weeks later, it mattered little within wide limits when Graves arrived, if only he brought a sufficient force. This he did not do. In our own day, we have seen Togo and Rojdesvenski draw together with massed forces in the Japan Sea and fight for that command which was essential to the land operations and the determining factor in the war. The position of the Russian Admiral was much like that of Graves. The time of his arrival was less important than the fighting power of his fleet and his own tactical skill.

If one side is determined to fight and the other is not willing, the latter must withdraw either into port or to some other area. Both cannot remain in those waters without fighting. The larger the forces and the smaller the area, the greater will be the difficulty to avoid battle. So often has this been found to be the case that it amounts to a truism, but to emphasise the point we may ask whether two large opposing fleets could remain long in the North Sea without coming into collision if one was bent on fighting? In the days of sail they came quickly into contact in such a narrow field, and under modern conditions will have as good a chance of doing so in larger areas, since steam and wireless telegraphy have enlarged the sphere of action

on both sides. No designed superiority of speed in the ships of the weaker can do more than delay the meeting, because experience shows that sooner or later either failure of speed or some unforeseen circumstance brings it about. The larger the squadron the greater is the chance that speed may fail; its precarious nature when ships are pressed and the wide margin on service between ships nominally the same is well known. If the weaker cannot remain in the area when his ships are concentrated, still less can he do so if they are spread. Such a policy only facilitates the enemy's work, as he can more easily pick up detached ships. In fact, to concentrate power in capital ships, and then to disperse them is a contradictory policy impossible to justify.

A good position is more important than superior speed, and can be used to counterbalance the strategical advantages belonging to the latter. Thus, when Suffren captured Trincomalee in the year 1782, he placed himself at Batacoloa, less than one day's sail from his objective, while Hughes was at Madras fourteen days distant. No conceivable superiority of speed could have saved the place. Again, as Captain Mahan has clearly shown in the important paper contributed to the June 1906 number of the 'Proceedings of the U.S. Naval Institute,' Togo's position at Mesampho would

have enabled him to intercept Rojdesvenski irrespective of the route taken to Vladivostok, even if the Russian fleet had been faster than the Japanese.

When examined by the light of the preceding remarks, the naval manœuvres of the year 1906 will be found to be instructive. It will be remembered that the forces were very unequal, the Red (English) being more than twice as strong as the Blue (the enemy). The former had 41 capital ships and 20 cruisers, or 61 in all, of which rather less than one-third were based on Gibraltar and the remainder on Falmouth or other English ports; the latter had 18 capital ships and 9 cruisers, or 27 in all, at Berehaven or other Irish ports. The nominal area of the operations was included between the parallels of 30° N. and 60° N., and between the meridians of 20° W. and 10° E.; it measured about 1800 miles in length, and varied from 1000 to 500 miles in breadth. The real area was much smaller, as it was the trade-route from the Chops of the Channel to Gibraltar, and measured not more than 900 miles in length by, perhaps, 350 miles in width. Blue's aim was to tempt Red to use his force improperly, under the pressure of public opinion. With this end in view he was to attack the trade in a strictly limited area, completely commanded by

a greatly superior force. Red knew this, and, as all ships were to put to sea at noon on June 24, he was not troubled with Nelson's doubts during the Trafalgar campaign. Blue spread his ships in the limited area. As was to be expected, he was beaten in detail and compelled to fly for safety to his base in the North Sea with a mere remnant of his force. In time of peace it is difficult to conceive the triumphant and exultant feeling which the news of such a victory would raise in this country. What might have been expected to happen to Ganteaume's fleet in 1805 if Napoleon had ordered him to put to sea from Brest and to attack the trade in the same waters, if the French admiral had done so and had spread his ships, if Nelson at Gibraltar and Cornwallis in Torbay had known his mission and the time of his sailing? Napoleon would never have had any doubt. He was too great a master of the Art of War to spread an inferior force within striking distance of a greatly superior fleet. The manœuvres of the year 1906 certainly show that in the future as in the past, fleets will be composed of ships varying in speed, but they do not prove that superior speed has any particular strategical value, unless it is an advantage to have some ships able to run away. They appear rather to point to the disastrous influence of wrong strat-

egical conceptions, and to the imperative necessity of a closer study of war conditions.

We are now in a position to judge whether superior speed is of such value in a capital ship that other qualities should be sacrificed in part to obtain it. We have shown that superior speed is only one of several factors which contribute to success in war. In tactics it is less important than tactical skill, and it gives a very limited control over the range. In strategy it is discounted by the demands of enduring mobility, by the conditions of war, and by the strategical ability of the admiral. In all cases its uncertainty is such that reliance cannot be placed upon it. Our conclusion is that in designing a capital ship an increase in speed is right if it results from a natural growth, as already explained, but that otherwise it is wrong. The advance from the *Devastation* to the *Prince George* was right. In that case speed was increased, but concurrently great additions were made to the offensive power. The saving in weight due to improved machinery was used chiefly to increase fighting power, while speed was allowed to grow. The designer compromised on the two, but took care to lean strongly towards the former. This is the view so ably put by Captain Mahan in the paper already referred to. The practice of the most successful ship-

designer and the theory of the foremost thinker are in accord. Our belief is, that future wars will show the necessity for a large number of capital ships moderate in size supported by a small percentage exceptional in power; that as these ships are to act together their speeds should be the same, and should be that best suited to the more numerous class; that the exceptional ships should excel in fighting power, and not in speed.

We turn to the ships now under construction. Are the superior speeds given to the *Dreadnought* and *Invincible* right or wrong? A complete answer cannot be given because the facts concerning these ships are not fully known, but a partial one is to be found by comparing the *Edward VII.*, *Lord Nelson*, and *Dreadnought*. The data for these ships as designed are—

	Length.	Breadth.	Length / Breadth.	Mean draught.	Displacement.	Indicated horse-power.	I.H.-P. per ton of displacement.	Speed.
	feet	feet		feet	tons			knots
Edward VII.	425	78	$\frac{5\cdot4}{1}$	$26\frac{9}{12}$	16,350	18,000	1·10	18·5
Lord Nelson	410	$79\frac{6}{12}$	$\frac{5\cdot2}{1}$	27	16,500	16,750	1·01	18·0
Dreadnought	490	82	$\frac{6}{1}$	$26\frac{6}{12}$	17,900	23,000	1·28	21·0

The weights allotted to the different elements in the ships when fully loaded are, as far as known—

	Edward VII.		Lord Nelson.		Dreadnought.	
	tons	percentage	tons	percentage	tons	percentage
Equipment, Armament, Machinery	5,325	30·6	5,680	32·3	5,900	30·0
Coal . .	2,000	11·5	2,000	11·4	2,700	13·7
Armour, Hull . .	10,075	57·9	9,920	56·3	11,100	56·3
	17,400	100	17,600	100	19,700	100

Comparing the *Dreadnought* with the *Lord Nelson*, the percentage of displacement given to hull and armour is the same, but in the former 2·3 per cent has been transferred from equipment, armament, or machinery to coal. Defensive power has been maintained constant, while to enduring mobility, either offensive power or speed, or both, have been sacrificed. Which is it? The three knots designed extra speed of the *Dreadnought* is due partly to larger size, and partly to a great increase in the horse-power per ton of displacement. Turbine machinery may account for a portion of the last item, but not, it is believed, for the whole. A comparison of the weights said to be allotted to the armament in the *Edward*

VII. and *Lord Nelson* seems to indicate that in the *Dreadnought* fighting power has been trenched upon. The designer in compromising between fighting power and speed has leaned strongly towards the latter. It would not surprise us to find that, as compared with the *Lord Nelson*, a sensible percentage of displacement has been transferred from fighting power to speed in the *Dreadnought*, and that the difference between the weights allotted to the offensive power in the two ships is not large. The truth or otherwise of our belief can be determined by publishing the facts — *i.e.*, the weights allotted to the different elements, which has not yet been done. If fighting power has been sacrificed to speed, Foreign Powers will be able to produce a more effective instrument of war on the same displacement by not doing so.

The *Invincible*, like the *Dreadnought*, approaches, when fully loaded, 20,000 tons in displacement and £1,750,000 in cost. The three or four knots extra speed which she has must involve a large sacrifice of fighting power. The details published are insufficient to determine its extent. The want of information is not material, because the omission of such ships from the new programme is an eloquent indication that ships of that class are dead, and

that no more will be built. By argument the class have been killed, and it only remains to inter them decently away from the public gaze.

In the Memorandum on new construction recently issued, the Admiralty show quite clearly why fighting power has been sacrificed to speed. They say, when speaking of the *Dreadnought*, "While it is recognised that broadside fire is held to be the most important in a battleship, all-round fire is also considered of great importance, since it lies in the power of an enemy to force an opponent, who is anxious to engage, to fight an end-on action." As far as we can see, the only way of forcing an opponent, *who is anxious to engage*, to fight an end-on action, is to run away from him. Being willing to fight, he will not run away, and if we do not flee he will fight broadside on, therefore we ourselves must turn tail. We have always held that the advantage of superior speed is that it gives the power of running away; but it is surprising to find it laid down by authority that it is important to arm a British ship with that object in view.

The following paragraph is also remarkable:—

"Mobility of forces is a prime necessity in war. The greater the mobility the greater the chance of obtaining a strategic advantage. This mobility is made up of speed and fuel endurance. Superior speed also gives

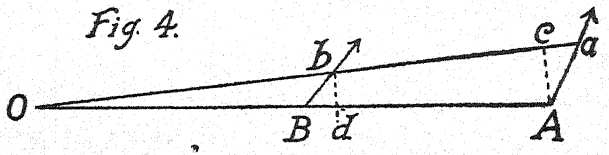
the power of choosing the range. To gain this advantage, the speed designed for the *Dreadnought* is 21 knots."

It is these half-truths which have cost this nation so dear. The waste of money on speed in the ships referred to in the Memorandum from which these extracts are taken cannot be less than a million sterling. If equality in the speed of capital ships and the natural growth due to the turbine had been accepted, the same amount of fighting power could have been put afloat for less money. The saving would have been, perhaps, on the *Dreadnought* £150,000, and on each of the three *Invincibles* at least £300,000, or upwards of a million sterling. Again, is there no waste on the five ocean-going destroyers, each of 800 tons displacement, 33 knots speed, armed with three 12-pounders, and costing £140,000, or twice that of existing destroyers? and on the *Swift*, of 1800 tons displacement, 36 knots speed, armed with four 4-inch guns, and costing £280,000?

APPENDIX.

Proof of Equation (1).

Fig. 4.



Let Aa be the path of A for a short time, Bb that of B for the same interval, and AB = ab the constant distance or range. Draw Ac and bd perpendiculars to ab and AB respectively. Then ultimately OAc and Obd are isosceles triangles, and Ad = bc also Bd = ac, hence Bb Cos bBd = Aa Cos caA, and therefore $\frac{\text{Cos } ca\text{A}}{\text{Cos } b\text{B}d} = \frac{\text{B}b}{\text{A}a} = \frac{v}{\text{V}}$; and since caA is the angle between the bearing of B and the stern of A = $\frac{\pi}{2} - \theta_{\text{A}}$, and bBd is the angle between the bearing of A and the head of B = $\frac{\pi}{2} - \theta_{\text{B}}$, we get $\frac{\text{Sin } \theta_{\text{A}}}{\text{Sin } \theta_{\text{B}}} = \frac{v}{\text{V}}$

Note.—An unknown correspondent points out that if the range is not to alter, it is clear that *at any instant* the components of the two speeds along the line of bearing (fig. 1) must be equal. This is a more easy solution of the problem.

X.

THE GROWTH OF THE CRUISER.[1]

WHATEVER be the ultimate object of a war, the immediate aim of any special operation is to acquire control of one or more particular water areas, in order that our own ships may be free to circulate in them without hindrance, while those of the enemy cannot do so. This involves the presence in the area of a force superior in fighting power to that of the enemy. The force must be of two kinds:—

1. A massed fleet of capital ships.
2. Detachments of lighter vessels—of cruisers and small craft.

The control of the area depends primarily upon the first, but can never be complete without the aid of the second. Before the decisive battle the reciprocal action of the one fleet on the other compels concentration, governs movements, and prevents the detachment of any

[1] Blackwood's Magazine, January 1907.

ship whose absence would weaken materially the fighting power of either side. This leaves a large part of the area free to the action of isolated ships of no great force. The capital ships must be massed, the lighter vessels can be spread. The insignificance and dispersion of the latter covers them from effective attack by the former. The cruisers and small craft menace communications, attack the trade, and are free to fight it out together undisturbed. After the decisive battle the victors can relax somewhat their concentration, and are able to send their capital ships to aid their cruisers. But the numbers of the former are small, and the secondary services then become more numerous and exacting. Hence the calls for the latter become louder, especially on the part of the victor. It is proposed to show that these are the lessons evolved from war experience in the past, and to examine the extent to which they are applicable in the present.

The necessity for ships of different sizes has always been admitted in practice. In the year 1588, which saw the defeat of the Spanish Armada, the Queen's ships in commission consisted of—

	Burthen in Tons.					
	Above 600.	400 to 600.	200 to 400.	100 to 200.	50 to 100.	Below 50.
Number .	5	10	5	3	7	3

Some fifty years later, similar gradations in size still existed, and the Royal ships were divided into six classes or "rates." This classification, which lasted upwards of two centuries, followed no recognised military principle, but was an administrative arrangement to facilitate supply, and to govern the wages paid to the officers and men.

Under the Commonwealth the "rate" depended upon the number of men carried. Thus—

	1st Rate.	2nd Rate.	3rd Rate.	4th Rate.	5th Rate.	6th Rate.
Number of men . .	400 and upwards.	300	200	140	80	40

Ships having less than 40 men were not "rated."

The first clear evidence of the influence of any military principle on shipbuilding is to be found during this period. It will be remembered that the Civil War began in the year 1642, that the King was beheaded seven years later, and that in the year 1652 broke out the First Dutch War, which lasted two years. Then came the expedition of Penn and Venables to the West Indies, Blake's cruise to the Mediterranean, and finally the war with Spain in the year 1656. During this period the controlling minds had large experience of war both by land and sea, the latter especially being on a large scale. The result is distinctly seen in

the shipbuilding under the Commonwealth, as summarised in the following table :—

SHIPS BUILT UNDER THE COMMONWEALTH.

Year.	CAPITAL SHIPS.					CRUISERS.					Small Craft.
	LARGEST.			SMALLEST.		LARGEST.			SMALLEST.		
	No.	Burthen in tons.	No. of guns.	Burthen in tons.	No. of guns.	No.	Burthen in tons.	No. of guns.	Burthen in tons.	No. of guns.	
1649	4	778	64	375	30	...	...	...	...	...	...
1650	9	571	40	354	30	1	...	26	...	...	...
1651	5	...	56	...	32	6	289	22	...	20	...
1652	5	...	46	400	32	1	...	20	...	...	5
1653	9	740	60	481	38	...	...	...	...	...	1
1654	13	769	52	550	40	7	319	28	255	22	2
1655	2	1229	80	742	52	3	269	22	230	22	4
1656	2	1050	64	...	...	3	235	26	194	20	4
1657	...	...	...	...	...	1	230	22	...	...	6
1658	1	1108	70	...	...	1	230	28	...	...	...
1659	2	703	52	636	44	...	...	...	...	...	1
	52					23					23

The table does not include 33 capital ships, 25 cruisers, and 35 small craft which were either bought or captured and added to the navy. Of the 98 ships referred to in the table, 52 were of more than 350 tons burthen, carried upwards of 30 guns, and may be looked upon as capital ships; 23 were between 200 and 300 tons burthen, were armed with 20 to 28 guns, and may be classed as cruisers; the remainder were small craft. The capital ships grew in size and power, the smallest built after the Dutch war being as powerful as the largest launched before it. The cruisers did not in-

crease in size: the margin between the two classes became wider and more pronounced. The cause is to be found in the different work required from each. The former were developed under the stress of the great battles with the Dutch, which were decided chiefly by fighting power and inaugurated engaging in line — a formation favourable to uniformity in size. The latter were required to deal with the fast Dunkirk privateers, and were evolved under the recollection of the damage done to British trade by those ships and by the Sallee rovers during the reign of Charles I. In it the aim was speed and not fighting power, as in the capital ship. Here is seen at work the military principle which eventually divided the ship of the line from the frigate or cruiser used for detached service. When the Third Dutch War ended in the year 1674, the principle was generally acknowledged. Ships of the first, second, and third rates were alone considered suitable for the "line." Pepys said that the fourth-rate was quite unnecessary, and added, they "serve now only for convoys (which fifth-rates for the most part can do) and to fight against the Turks, . . . so that the thirty-six fourth-rates we now have are fully as many or more than necessary." As a consequence, the 30 ships built under the special Act of 1676-77

—the Naval Defence Act of the day—included only first, second, and third rates. No fourth-rate was launched until ten years later. The particulars of the smallest ship of the line or capital ship, of the intermediate class or fourth-rate, and of the largest fifth-rate or cruiser of the period, were—

	Rate.	Number of guns.	Weight of broadside in lb.	Burthen in tons.	Number of men.
Smallest ship of the line or capital ship	3rd	70	620	1072	460
Intermediate . .	4th	50	?	644	280
Cruiser . . .	5th	32	159	333	135

The smallest capital ship was three times the size and force of the largest cruiser. Between the two was an intermediate class, which the stress of actual war had forced out of the line and into the convoy service.

New conditions soon altered this relation between the several classes. The War of the League of Augsburg (1689-97) in the time of William and Mary, and the War of the Spanish Succession (1702-13) in the reign of Anne, were neither of the same kind as the wars with the Dutch. They were waged by Great Britain in alliance with Holland and other Continental Powers against France assisted by Spain. They were not purely maritime. The struggle at sea was subsidiary to that on land. In the Dutch wars the leading and only feature was the great sea battle, but this was not so in those with

France. In the one case a massed fleet of capital ships sufficed; in the other a numerous force of cruisers and small craft was required in addition for detached service, because, after La Hogue in the year 1692, as after Trafalgar a century later, the aim was to reap the fruits of victory—*i.e.*, to hold completely the water area bordering on the scene of the land operations. The difference can be seen by comparing the shipbuilding and the composition of the navy during the two periods. The ships built, omitting those below sixth-rates, numbered—

	1st Rate.	2nd Rate.	3rd Rate.	4th Rate.	5th Rate.	6th Rate.
Dutch period, 1660 to 1688	10	14	32	15	7	7
Part of French period, 1702 to 1712	2	6	28	36	34	20

The British Navy at the undermentioned periods consisted of—

Rate.	At the Restoration, 1660.	After the Third Dutch War, 1675.	Before the French War, 1688.	At the Peace, 1697.	At the Peace of Utrecht, 1713.
1st	3	8	9	6	7
2nd	11 } 30	9 } 39	11 } 59	13 } 62	13 } 63
3rd	16	22	39	43	43
4th	45	37	41	56	70
5th	37	16	2	42	44
6th	16	8	6	40	30

During the Dutch period the numbers of the three larger rates — the true capital ships — doubled, of the intermediate fourth-rate remained constant, and of the two smaller rates

decreased. During the French period the very reverse occurred.

It was not in numbers only that the difference lay. The gap between the capital ship and the cruiser was closed during the French period. On the one hand, in accordance with the law of equality, fourth-rates carrying 50 to 60 guns were readmitted to the line, because a large proportion of the French capital ships were less powerful than the Anglo-Dutch third-rates. The composition of the fleets at the battles of Beachy Head in the year 1690 and of Malaga in the year 1704 shows this.

Guns.	Beachy Head.			Malaga.		
	Dutch.	British.	French.	Dutch.	British.	French.
80 and upwards . .	2	8	8	1	14	16
60 and below 80 . .	12	22	20	9	22	18
Below 60 . . .	8	4	40	2	3	17
	22	34	68	12	39	51
	56			51		

On the other hand, a smaller "intermediate," classed as a fifth-rate, gradually came into being during the eleven years' War of the Spanish Succession, and at the Peace became stereotyped as a 40-gun ship. She carried her guns on two decks, and was not distinguished for speed. This may have been due to the convoy system, which required in the ship escorting slow traders fighting power rather than speed.

The cruiser proper carrying her guns on one deck was represented by a 20-gun ship classed as a sixth-rate. This war tended to distribute fighting power rather than to concentrate it, because the French objective after their defeat at La Hogue was the trade and sea communications of Great Britain, and not her military force, at which the Dutch had aimed. The two groups of wars indicate that the size and power of the ships, and the number of these in each class, depend largely on the ships used by the enemy, and on the sort of war.

The following typical ships were the result of this war :—

	Rate.	Number of guns.	Weight of broadside in lb.	Burthen in tons.	Number of men.	Cost. £
Smallest ship of the line or capital ship	4th	50	315	755	280	13,212
Intermediate . .	5th	40	180	594	190	8,731
Cruiser . .	6th	20	60	374	130	4,702

During the middle and end of the eighteenth century, four great wars were waged by Great Britain with France, assisted from time to time by Spain. They were the connected acts of one great drama, with intervals of peace preparation to renew the struggle. In the first two wars the navies of the allied Powers were beaten, but after each defeat they grew in strength and efficiency until the third, when Great Britain held her own with difficulty. The long struggle culminated at Trafalgar, with the final defeat of

France. Like the Dutch wars they were contests for sea supremacy, but the scene was laid in a wider field. They were not confined to the narrow waters of the North Sea, where the massed fleet of capital ships could effectively hold the whole area, but were fought out on the wide ocean—where a large force of cruisers, both public and private, was found necessary to cover the field outside that immediately commanded by the great fleets. They show not only the capital ship growing in fighting power as in the Dutch wars, but the parallel development of the cruiser.

The first war (1739-48) began with Spain, who was joined by France five years later. It is distinguished for the inefficient way in which the navies on both sides were handled. The causes of the British failure are not far to seek. The War of the Spanish Succession had been waged by Great Britain with a large superiority of force. It had given her unquestioned maritime supremacy and a peace lasting virtually a quarter of a century. The first condition tends to engender conceit, the second to encourage pedantry, the two qualities combining to produce a self-complacent attitude of mind more favourable to error than to truth. Precisely the same phenomena presented themselves after Trafalgar, with results which were felt during

more than two generations. To a somewhat similar cause may be ascribed the destruction of the Prussian Army at Jena by Napoleon.

Mental stagnation was the predominant feature of the British Navy in the year 1739. During the preceding long interval of peace, no attempt had been made either to improve the ships or to add to the military knowledge and efficiency of the officers. Fortunately both France and Spain had limited their efforts to the first, and neither the one nor the other produced a naval Napoleon during the war which followed. Time was given to introduce reforms. The *personnel* was invigorated by the rise of capable leaders like Hawke and Boscawen; the *matériel* was improved by the shipbuilding reforms initiated in the year 1744-45 by Sir John Norris's Committee, which proposed no change of type but an increase in the size and force of the various classes of ships to place them on an equality with the corresponding ships of France and Spain. The resulting growth of the capital ship has been already set forth in Article VIII.; the effect on the cruiser remains to be explained. The quickening influence of the war was felt on both sides. After the Peace of Aix-la-Chapelle in the year 1748, the French naval mind became extremely active. The Navy was rebuilt on improved lines. French genius,

more active than British, produced a new and faster type of cruiser or frigate. The result was that a great corresponding change was brought about in the British Navy during the following Seven Years' War, which began in the year 1756.

At the beginning of this war, the typical British ships were—

	Rate.	Number of guns.	Weight of broadside in lb.	Burthen in tons.	Number of men.	Cost in the year 1745. £
Smallest ship of the line or capital ship	4th	50	414	1047	350	20,251
Intermediate . .	5th	44	285	862	280	14,448
Cruiser . . .	6th	24	102	511	160	7,493

But during the war the typical ships built were—

	Rate.	Number of guns.	Weight of broadside in lb.	Burthen in tons.	Number of men.	Cost. £
Smallest ship of the line or capital ship	3rd	64	600	1340	500	20,922
Intermediate . .	4th	50	414	1046	350	?
Cruiser or frigate .	5th	32	174	652	220	7,028
Do. .	6th	28	114	599	200	6,326

These last vessels were really similar to those with which France began the war. The law of equality forced Great Britain to use similar instruments. As in the Dutch wars, the fourth-rate was forced out of the line and into the convoy service by her want of fighting power. The 44-gun two-decked ship was squeezed out completely by the descent of the fourth-rate, and by the advent of the one-decked frigate, whose distinguishing characteristic was speed combined with moderate fighting power.

The war was disastrous to the Navy of France, and in a less degree to that of Spain. This was as much due to the energy and genius of the elder Pitt in directing the operations as it was to the professional knowledge and skill of the great war-bred seamen of the day — Hawke, Saunders, and Boscawen — in conducting them. Out of defeat the French drew fresh inspiration. They rebuilt their Navy, with the result that both Great Britain and France began the third war, in the year 1778, with ships of the same type and force, but class for class the French ships were of greater tonnage. The smallest ship of the line was the 64-gun ship, and the typical frigate carried 32 guns. During the war the frigates on both sides grew in tonnage and power.

The following are typical of those built:—

	Number of guns.	Weight of broadside in lb.	Burthen in tons.	Number of men.
British nominal 38 .	46	297 & 72[1]	946	280
" " 36 .	44	279 & 72[1]	880	270
French " 40 .	40	332	1063	360

[1] Carronades.

The difference between the nominal and actual number of guns carried is due to the addition of carronades, which were introduced at this time but were not counted among the guns.

This war, unlike the previous one, was in its results far from favourable to Great Britain.

The failure was due in part to the absence of Chatham's directing hand, in part to the great increase in the French and Spanish Navies, and in part to their increased war experience, which produced at least one great leader—the Bailli de Suffren—who, fortunately for Great Britain, was only employed in a secondary sphere.

During the Peace which followed, France discarded the 64-gun ship, and retained nothing between the 74-gun ship and the frigate. Great Britain retained the 64-gun ship and the other "intermediate classes," continuing to build them in very reduced numbers. This was no doubt done to meet the demands of the convoy service. When the Revolutionary War broke out in the year 1793, the ships of the two navies stood thus :—

	FRANCE.					GREAT BRITAIN.				
	No. of guns.		Weight of broadside in lb.	Burthen in tons.	Crew.	No. of guns.		Weight of broadside in lb.	Burthen in tons.	Crew.
	Nominal.	Actual.				Nominal.	Actual.			
Smallest ship of the line or capital ship	74	78	1002 & 80[1]	1890	690	64	70	600 & 36[1]	1380	494
Intermediate	...	Nil	...	...	...	50	58	414 & 60[1]	1044	345
						44	52	318 & 72[1]	900	297
Cruiser or frigate	40	44	334 & 80[1]	1148	330	38	42	300 & 36[1]	950	277
	36	40	189 & 80[1]	950	300	32	38	282 & 18[1]	710	217

[1] Carronades.

The French frigate of the larger class was rather more than one-half the size and one-third the power of the smallest ship of the line. The gap between the two was well defined. Out of a total number of 79 frigates only 15 were of this size, the remainder were smaller. During the war, the law of equality again compelled Great Britain to follow the French lead. She gradually ceased to build both the 64-gun ship and the intermediate classes. In the year 1812, after nearly twenty years of continuous war, not more than 13 such ships were in commission, and the typical ones under construction were—

	Rate.	Number of guns. Nominal.	Number of guns. Actual.	Approximate weight of broadside in lb.	Burthen in tons.	Crew.	Cost. £
Smallest ship of the line or capital ship	3rd	74	80	736 & 246[1] = 982	1750	600	76,506
Cruiser or frigate	5th	38	50	282 & 288[1] = 570	1080	284	39,268
Do.	5th	36	42	223 & 234[1] = 457	950	264	?

[1] Carronades.

This particular class of 74-gun ship represents one-third of the ships of the line then built and two-thirds of those building; the frigates stand for two-thirds of those built and for nearly all those building. It is true that among the total of 153 frigates were 6 of exceptional size. One of these may be mentioned—the *Endymion*, of 1277 tons, and armed with 28 24-pounders, 2 18-pounders, and 20 32-pounder carronades. The

most marked result is the well-defined interval between the ship of the line and the frigate. The fighting power and cost of the former were nearly double those of the latter.

The fluctuations in the numerical strengths of the several classes are shown in the following table :—

Class of Ship.	First War.		Second War.		Third War.			Fourth War.	
	Begins 1739.	Ends 1748.	Begins 1756.	Ends 1762.	Begins 1775.	France intervenes, 1778.	Ends 1783.	Begins 1793.	America declares war, 1812.
Ships of the line or capital ships	124	138	142	141	131	131	174	113	113
Intermediates	22	42	38	45	16	34	53	30	14
Cruisers .	28	54	45	97	82	105	145	96	153
Small craft .	22	45	48	84	64	119	155	65	343

The large number of ships of the line at the end of the third war marks the severity of the struggle. The intermediate class includes 44's during the first war and at the opening of the second, 50's and 44's after that time. By the year 1812 the 64's are also merged in it, and the whole class is practically about to disappear. The most marked feature is the increase in the number of cruisers and small craft during each war, and especially of the latter during the interval 1775-78, when the revolting American colonies had not yet been joined by France.

The war, which began in the year 1812, marks a critical stage in the development of the frigate. The leading features of that war have been sketched in Article V. To the works of Captain Mahan and Mr Henry Adams the reader is referred for fuller information. The conditions were peculiar. The American Navy included no ship of the line, and consisted of only seven frigates, besides a few small craft. The whole interest centres round the three heavy nominal 44-gun frigates—*Constitution*, *United States*, and *President*. The first captured two British nominal 38-gun frigates—the *Guerrière* and *Java*; the second beat another such ship—the *Macedonian*. The *Constitution* and the *Guerrière* may be taken as types of the two classes. According to Mr Roosevelt, their armaments were—

Constitution.	Guerrière.
32 long 24-pounders.	30 long 18-pounders.
22 32-pounder carronades.	2 long 12-pounders.
—	16 32-pounder carronades.
54	1 18-pounder do.
	—
	49

Their comparative force was—

	Tonnage. British.	Tonnage. American.	Number of guns.	Broadside. Weight in lb.	Crew.
Constitution .	?	1576	27	358 & 328[1] = 686	456
Guerrière .	1080	1338	25	264 & 312[1] = 576	272

[1] Carronades.

The *United States* and *President* were armed with 42-pounder carronades, and their broadside

was, therefore, about 100 lb. heavier. These three heavy frigates were really "intermediates." In fighting power they fell below the 74—the smallest ship of the line, and above the nominal 38 — the average frigate. They differed little from the discarded 64. They were not remarkable for any superiority of speed. How were they to be met? They could only be defeated by bringing against them a superiority either of skill, or of force, or of both. A large number of British officers, forgetting the teaching of Nelson and other great leaders in war, did not understand this simple truth. Misled by a long series of unbroken successes, and filled with overweening self-confidence, they not only neglected to acquire skill, but took no steps to bring into action a superior force. The result was defeat in the early part of the war. The question of skill lies outside our argument, which is concerned only with the distribution of fighting power.

There are two different methods of concentrating fighting power — in one large unit of great force, or in several smaller ones of moderate force. The heavy American frigate represented then, as the modern armoured cruiser does now, the first method. The idea underlying both classes is a single ship which shall be superior to any vessel employed on detached service. The reciprocal effect of such an idea

must mean dimensions ever growing, until the ship becomes so powerful that she cannot be detached without materially weakening the main fleet. In fact, its logical conclusion is the ship of the line or battleship. The idea must therefore be unsound. The failure[1] of the heavy frigate in the war of 1812, and of the armoured cruiser in the Russo-Japanese War, supports this view. Underlying the second method is the idea that ships not intended for the line shall be as small as is compatible with the work to be done, but not so small that the large ones will not, in combination, be a match for any ship not of the line. The reciprocal effect of this idea tends to decrease size and to increase numbers. The British Admiralty adopted both methods against the American 44's. They built powerful frigates to match them, and they strengthened their detachments, giving orders that British frigates were not to cruise singly.

It was to the second method and not to the first that success was due. The American ports were blockaded by squadrons. The *President* was captured by a squadron composed of the *Endymion* (40), *Pomone* (38), and *Tenedos* (38). It is true that the *Majestic* (56)—the heavy ship specially cut down from a 74 to meet the American 44's—was present, but she never

[1] See Article V.

fired a shot. The *President* would have been captured if the *Majestic* had been absent. It was absolutely unnecessary to build heavier frigates; the real needs were suitable strategical dispositions of the force already in existence, and care to see that the units were individually in an efficient state. There is nothing in the war of 1812 to controvert the lessons taught by previous wars. Even the small, fast American privateers, to whose action the large British losses were chiefly due, were only a revival of the seventeenth-century Dunkirk privateers and Sallee rovers. The failure to appreciate the conditions correctly need not surprise us, seeing that the nature of war has not been closely studied, and that until recent years no attempt has been made to draw any lessons from the past. As has been clearly proved, the tactical methods employed at Trafalgar were completely misunderstood at the time. The men, who were capable of that, might well be content to adopt the superficial view that great individual size and power must necessarily be all-important. The direct consequence was the large frigate of the nineteenth century, approaching the ship of the line in size and power. It is not necessary to dwell on those vessels in which both sails and steam were used. We pass at once to the ships dependent upon steam

alone, to the ships built under the Naval Defence Act of 1889, as a convenient starting-point.

The ships which were either built under, or grew out of, the Act of 1889 were—

	Date.		Class.	Weight of broadside in lb.	Approximate displacement fully loaded.	Crew.	First cost.	Designed speed in knots.
	Laid down.	Launched.					£	
Capital ships	1889	1891	Royal Sovereign	4 of 1250 5 of 100	14,700	730	840,000	17·5
	1890	1892	Barfleur	4 of 500 5 of 45	11,100	625	580,000	18·2
Cruisers	1889	1890	Edgar	2 of 380 5 of 100	7,750	540	410,000	20·0
	1889	1890	Latona	2 of 100 3 of 45	3,550	273	174,000	20·0
	1890	1893	Astræa	2 of 100 4 of 45	4,950	312	254,000	19·3
Small craft	...	...	Gunboat	2 of 45	735	91	60,000	21·0

As in the year 1812, battleships, cruisers, and small craft are all represented in this programme. Omitting ships of the *Barfleur* class, which were not repeated, a wide margin in size and cost is seen between the battleship and the large cruiser. The difference in the number of the crew, and perhaps also in the fighting power, is not so great, which suggests a suspicion that perhaps the *Edgars* were too large. To increase the enduring mobility, the *Latonas* grew into the *Astræas*, and finally into the *Talbots* of about 6000 tons, with some addition to the fighting power. There was still

a great gap between them and the battleship. These *Talbots*, when re-armed with 6-inch guns throughout, represented the ideal cruiser of that date. Such were the conditions, when the year 1894 saw the beginning of a great change of policy.

Two years before had been launched an exceptionally large Russian cruiser, the *Rurik*. She now had to be met, and the problem was how to do it. Would two or more *Edgars* or *Talbots* be equal to the task, or should larger ships be built? The decision was to build two *Powerfuls*.

The leading particulars of the above ships are—

Name.	Number of guns and weight of broadside in lb.	Displacement in tons.	Crew.	Cost. £	Designed speed.
Rurik . . .	2 of 190 7 of 90 3 of 45	10,900	770	...	18·0
Edgar . .	2 of 380 5 of 100	7,300	540	410,000	20·0
Talbot (re-armed)	6 of 100	5,600	470	276,000	19·5
Powerful . .	2 of 380 8 of 100	14,200	840	705,000	22·0

N.B.—The guns of the *Powerful* were protected by armour; those of the other three ships were unprotected, except two in *Edgar*, which were in casemates.

It will be observed that to match the *Rurik* in gun power two *Edgars* or two *Talbots* would be required. The *Powerful* was far superior to her.

The action of the British Admiralty in building the *Powerful* and other large cruisers caused

Russia to change her policy after the launch of the *Gromoboi*. She ceased to build such ships, and reverted to ships rather larger than the *Talbot*, with the same armament, but of higher speed—23 knots. May it be that she dimly realised the logical end of the competition in size? But other nations did not follow her. The era of large cruisers had begun, and must necessarily run its course. They eventually developed into the armoured cruiser, and have resulted in the *Invincibles* and *Edgar Quinets*, which are not cruisers but veritable battleships, in which fighting power has been sacrificed to speed. This is the natural and inevitable result of reasoning from false assumptions.

We turn now to the existing Navy, as enumerated in the Dilke Parliamentary Return, No. 129, of 24th April 1906, in which are included some ships not fit for service. If all the ships therein mentioned, good, bad, and indifferent, are counted, they may be classified as follows:—

	Built.	Building.
Capital ships	51	16
Intermediates	48	...
Cruisers	61	...
Small craft	44	...
Destroyers	143	18
Torpedo boats	87	...

Among the intermediates are included twelve of the oldest battleships and all the large

cruisers, except the *Duke of Edinburgh* and later ships which are counted as capital ships. The oldest battleships are degraded because they are no longer fit for the line. The large cruisers are included because they are not equal in fighting power to battleships, although they carry crews nearly as large, or even larger, and are almost as costly to maintain. Although not individually equal to capital ships, collectively they include such a large proportion of fighting power that they cannot be detached without weakening the main fleet. Take for example the manœuvres of 1903. The X fleet included 11 battleships with a broadside of 109 guns (6-inch and above), and 6 large cruisers with a broadside of 52 such guns. The latter carried nearly one-third of the total number of effective guns, and their help would be important in the fight. As a matter of fact, owing to various causes, 1 battleship and 5 large cruisers, with a broadside of 54 guns, were not present at the sham fight off the Azores. This was a very material loss of fighting power.

When a ship has been detached from the admiral, the time when she will rejoin is always uncertain, for two reasons. The movements of the fleet, which she has to meet, are liable to change, since they are dependent largely on those of the enemy whose intentions

are unknown. The decision of her commanding officer, when dealing with the unforeseen, is doubtful. Take, as an example, Nelson's movements before the battle of the Nile. His frigates parted company during the gale of wind which dismasted the *Vanguard*, and never rejoined. The senior officer, erring in judgment, returned to Gibraltar, where he thought the admiral must have gone. The above reasons are equally applicable whether the ships are moved by wind or by steam. Thus, when a ship is once out of communication it is impossible to be certain of her movements. But even when within call she may be too late, unless care is taken. Thus, at the Nile the *Alexander* and *Swiftsure*, two ships of the line, were two hours behind time in coming into action, because they had been detached some twelve miles to do the work of the missing frigates. The battle of Tsu Sima was decided within an hour of the two fleets sighting each other. What would have happened if Togo's armoured cruisers had been two hours distant from him when the enemy was sighted? He did not risk that, but kept them well in hand. The reader will now understand why the true cruiser is a ship whose fighting power is such that she can be detached without detracting from the strength

of the fleet. It will be observed that no such ships are building in this country. The vessels under construction are limited to capital ships and destroyers. This is an unprecedented state of affairs. The Navy will presently be reduced to the same condition as was Nelson prior to the Nile. When the next war comes, want of cruisers will be found written in the hearts of British admirals. What is the explanation? Lord Cawdor's Memorandum, dated 30th November 1905, gives the answer. That document reads :—

"Now the last two years has given the Board an opportunity for reviewing the fighting efficiency of classes of vessels which has never before been afforded since modern fighting vessels have been in existence. A great naval war has given us a practical demonstration of the comparative values of the factors that go to constitute the different classes of ships. This has been entirely in accord with the more theoretical conclusions of peace time; but the evidence of war has added authority to those conclusions, and so invested them with the conviction that action, which previously might have been looked on as premature, could no longer be delayed from mere opportunist considerations."

This is misleading. It affirms that war experience has been in accord with peace theoretical conclusions. To what peace conclusions is this meant to refer? Was it generally accepted before the war that the Whitehead torpedo could do so little damage to a battleship that

she could be easily repaired? That a port could be blockaded in spite of the presence of torpedo boats inside it? That large cruisers intended to prey on commerce would not be able to do so? Has the experience of the war been so carefully weighed and considered that we are certain to draw the right conclusions and not the wrong ones, as has been usual after every previous war? The Memorandum from which we quote affords weighty evidence to the contrary. Thus—

"We live in a period when changes are far more rapid and far-reaching in extent than has ever been the case before. The range of modern actions has, we may almost say, jumped from 3000 to 7000 yards, and the sea-going speed of our cruisers has risen from 18 to 23 knots. This means that cruisers of previous types are placed at a hopeless disadvantage in their legitimate function of scouting, since anything that cannot force home a 'reconnaissance' is of little use to collect information; and if to this is added the chance of such scouts being themselves captured or sunk, such vessels become an anxiety rather than an assistance."

There have certainly been many recent changes, but are they more rapid and far-reaching than has ever been the case before? The change from sail to steam was no more far-reaching than that from oars to sail. Neither the one nor the other was rapid. Was the introduction of the ram, or of the Whitehead torpedo, far-

reaching? Has not the ram been discarded? And is not the Whitehead torpedo decreasing in value? What is there really far-reaching in the increased rapidity of fire with the quick-firing gun? Does a modern battleship really fire a greater number of shot per minute than did the old 100-gun *Victory?* The *Dreadnought* certainly fires fewer. Again, the increase in the effective fighting range is a change in degree rather than in principle, and is therefore not far-reaching. How is it possible to contend that the advent of the 23-knot cruiser has placed cruisers of previous types at a hopeless disadvantage as scouts? Togo used these very ships for that purpose, and kept his armoured cruisers in hand for battle, for reasons which we have explained at length. But have cruisers and small craft no work to do in time of war other than scouting? We have written in vain if the reader is not in a position to answer these questions so far as regards the cruiser. To explain the *rôle* of the small craft in war a separate article is necessary. The writer regrets that he has been unable to complete it.

XI.

INVASIONS OVERSEA.[1]

THE people of this country have reason to be grateful to Mr Balfour for devoting so much time and thought to the study of the difficult problems involved in preparation for war, which in the case of Great Britain must so often depend upon the joint action of the naval and military forces. His statement in the House of Commons on May 11, 1905, was a great departure, in that for the first time the war policy of the Empire, under certain limited conditions, was discussed as a whole. The interdependence of the army and navy — so long fully understood and appreciated by the two Services—was officially recognised by the Government and the House of Commons. The acceptance of this important principle should conduce not only to closer co-operation between the land and sea forces, but to greater efficiency and economy.

[1] Blackwood's Magazine, July 1905.

It may be useful to set forth the principles which govern an oversea expedition—that particular operation of war which most concerns and interests the people of this country, and in which the fleet and the army are most closely associated. It is a mistake to suppose that any great and fundamental divergence exists between naval and military opinion on this subject. The naval mind is as convinced that the difficulties of an invader are increased by the existence of a defending army as is the military mind aware of the deterrent influence of a fleet. The naval mind favours a defending army, because this necessitates an increase in the size of the invading force; and the larger the expeditionary force, the less difficulty is there in meeting and stopping it. The military mind recognises that no expedition can succeed when directly opposed by a superior naval force. Each school agrees that both land and sea forces are necessary, and recognises the complexity of the problem involved in assigning to each its appropriate and fitting sphere of action. The military view is set forth with much ability by Colonel Callwell, an officer on the general staff of the army, in a work recently published.[1]

[1] Military Operations and Maritime Preponderance: Their Relations and Interdependence. By Colonel C. E. Callwell. William Blackwood & Sons. 1905.

It will be instructive to examine the problem by the light of history—to appeal to the judgment and practice of those who were face to face with similar questions in the past, and to ascertain whether the lessons which they taught are still applicable. The attempted invasion of this country by the Spanish Armada is the classic example of this operation of war, and our greatest teacher is Francis Drake, whose genius for war has only been fully appreciated since the recent publication of papers relating to the war by the Navy Records Society.

Fighting of an irregular sort had been going on for several years between the seamen of Spain and England before the idea of invasion was suggested to Philip II. This unofficial war was a phase of the great religious and dynastic struggles of the sixteenth century, which witnessed the rise of the Dutch Republic, prepared the way for the union of England and Scotland, and led ultimately to the downfall of Spain and the rise of France under the House of Bourbon. The men who had shared in these wars and had witnessed the long struggle with the advancing Turkish power, defeated at last at Lepanto, must have something to teach us.

A Spanish expedition against England seems to have been first seriously considered in 1583, and to have begun to take definite shape in

1585, when the first official act of war was the seizure of English merchant ships in Spanish ports. England at once took the offensive, sending a military force to the Low Countries to help the Dutch; while Drake, with a mixed naval and military force, sailed on his famous expedition to the West Indies and Spanish Main to harry the sources whence Spain drew the wealth required to prosecute the war. The return of Drake in July 1586, and the reports of his success, provoked Philip to attempt the invasion. His preparations were continued and were pressed on more actively after his political objections had been removed by the execution of Mary Stewart in the following February. The reports from Spain became so grave that, in December 1586, Elizabeth decided again to take the offensive, and to send out a joint naval and military expedition under the command of Drake to "impeach[1] the provisions of Spain."

It is to be remembered that Philip, by whom England was threatened, was then believed to be the most powerful monarch in Christendom. He reigned over Spain and Portugal, with all their vast colonial possessions, besides Naples, Sicily, and the Netherlands. The whole of the resources of these countries, during a period of

[1] "Impeach" is here used in the sense of to "hinder."

more than two years, were devoted to the enterprise. His general plan was to assemble at Lisbon a powerful fleet, which, when it ultimately left that port, consisted of 130 ships, having an aggregate tonnage of 57,868, and carried upwards of 30,000 men, of whom 8000 were seamen. On arrival in the Channel this force was to be supplemented for the invasion by an army estimated at 25,000 men, under the Duke of Parma, which was to be transported in boats to England from the Netherlands' ports—Dunkirk and Nieuport. In the spring of 1587, the English plan was with a small squadron to keep the command of the narrow seas, and blockade the Duke of Parma; while Drake's commission was

> "to impeach the joining together of the King of Spain's fleets out of their several ports, to keep victuals from them, to follow them in case they should be come forward towards England or Ireland, and to cut off as many of them as he could and impeach them landing; as also to set upon such as should either come out of the West or East Indies into Spain or go out of Spain thither."

And finally, "he was directed to distress the ships within the havens themselves."

Drake, with twenty-three ships, left Plymouth on April 2, and fourteen days later was off Lisbon, ready to strike at the scattered Spanish squadrons. On the 19th he reached Cadiz, and

acted as did Nelson under somewhat similar circumstances two centuries later on the great day of Aboukir. The day was far spent, and but little more than one hour of daylight remained; nevertheless he at once attacked the shipping gathered in the port, capturing or destroying many vessels and a large amount of stores intended for the expedition. The work was completed in thirty-six hours, and he sailed on the 21st. From information gathered at Cadiz he learnt that Santa Cruz, the commander-in-chief, was at Lisbon superintending the equipment of the Portuguese ships; Oquendo in the north at Passages with a squadron nearly ready for sea; and that at Cartagena, within the Straits, were assembling ships and troops from Italy and Sicily ready to go round to Lisbon. But exposed to immediate attack was the veteran Admiral Alcalde cruising off Cape St Vincent with a small squadron: him Drake aimed at but missed, as he was warned in time and went into Lisbon.

It was at this time that Drake, when actually in contact with the Spanish preparations, wrote most strongly warning the Government. To Walsyngham he writes—

"I assure your honour the like preparation was never heard of nor known, as the King of Spain hath and daily maketh to invade England. He is allied with mighty

Princes and Dukes in the Straits, of whom (besides the forces in his own dominions) he is to have great aid shortly. . . . Our intent therefore is, by God's help, to intercept their meetings by all possible means we may. . . . This service, which by God's sufferance we have done, will (without doubt) breed some alteration of their pretences; howbeit all possible preparations for defence are very expedient to be made."

In a postscript he adds—

"I dare not a'most write unto your honour of the great forces we hear the King of Spain hath out in the Straits. Prepare in England strongly and most by sea. Stop him now and stop him ever. Look well to the coast of Sussex."

Such were the views of the great seaman, who was face to face with the responsibility of meeting the great oversea attack. His deeds proved that he understood, and appreciated, the power which resides in a great navy when manned by men bred up to the sea, inured to war, and possessed of a high spirit. But he was also fully alive to its limitations, and to the narrow margin which so often exists between success and failure in the operations of war. Above all, he must have recognised the possibility that this great force might not be used intelligently: he cannot have forgotten the difficulties he had met in getting adopted views, which he believed to be sound, and later experience proved to be entirely so.

The problem now was to hinder the Spanish concentration—to prevent the ships from Cadiz and Cartagena moving to Lisbon. A central base was necessary, and this Drake secured near Cape St Vincent by capturing Sagres Castle on May 5. He was off Lisbon on the 10th challenging Santa Cruz to come out and fight, returned on the 12th to Sagres, where he remained until the 23rd landing and refreshing his sickly crews, cleaning his ships, and harrying the coastwise trade, which last he had been active in doing since his arrival on the coast. He now proceeded to the Azores, and on June 9 captured off St Michaels a Portuguese East-Indiaman valued at nearly a million of our money, with which he reached Plymouth on the 26th.

The effect of these movements on Philip and his preparations was disastrous. Orders and counter-orders were issued in rapid succession. The king was possessed with two anxieties: he feared for his treasure fleets expected at the Azores, and for his ships and transports coming out of the Mediterranean. So long as Drake was on the coast, the latter were barred: when he was out of sight, both were threatened. The danger could only be removed by beating him, and no force was available for this. Santa Cruz could not move his ships without the men from Cartagena and Cadiz, and these, unable to move

by sea, had to march by land, which took time. It was not until July 1 that he was able to leave for the Azores to cover the expected treasure ships on which so much depended. He did not return until the end of September; and from this and other causes arising out of Drake's cruise, the sailing of the Armada was delayed until the following year.

On their return Drake's ships were paid off, and no further attempts were made to interfere with the Spanish preparations. Drake had pointed out that a squadron off Cape St Vincent "should be able to keep the [Spanish] forces from joining"; but the full meaning and effect of the strategy recommended was apparently not understood, and he was not allowed to sail. During the remainder of the year 1587 the main fleet was kept in the Medway, manned with skeleton crews and ready for rapid mobilisation; while a squadron watched the Duke of Parma, and the nucleus of Drake's force was held at Plymouth to threaten another raid.

In December the intelligence from Spain was such that a mobilisation of the fleet was ordered, and seems to have been completed in less than one week. Lord Howard of Effingham was commissioned as commander-in-chief, and Drake was given an independent squadron. Diplomatic difficulties and peace overtures led to indecision

and delay. The crews of many ships were reduced to one-half. It was not until February that Howard joined the squadron in the Downs, and a plan of campaign was formulated. The plan of the Council was to divide the fleet, and to form an eastern squadron in the Straits of Dover and a western in the Chops of the Channel; while Drake was to make a diversion to the Azores against the Indian fleets, and another expedition was to be sent to Portugal. This frittering away of force was indefensible, and shows how reasonable was the fear that the fleet might not be properly used. It was permissible and necessary to keep in the narrow seas a force sufficient to prevent Parma crossing, but to divide the capital ships in the manner proposed was to invite defeat.

The manœuvres during recent years have furnished instances of the dispersion of capital ships, which show that in questions of strategy we are not more advanced than were our Elizabethan forefathers, and that the risk of a mistaken use of the Fleet is an ever-present one.

Hawkyns was as little alive to the great principle of war that the true objective is the enemy's main fleet, which should be struck at with all available force. He was for sending a squadron to prey on the trade on the Spanish coast, while the main fleet remained in home

waters. Drake alone possessed the true strategic insight. He pointed out that the "groundwork" of the invasion was the force coming from Spain: if that were stopped the Duke of Parma would be equally kept back. Hence he held that the Western squadron should be made as strong as convenient, with a view to striking the first blow, and "putting into her Majesty and her people courage and boldness not to fear any invasion in her own country, but to seek God's enemies and her Majesty's where they may be found." Again he counsels an active offensive, by the words, "for that with fifty sail of shipping we shall do more good upon their own coasts than a great many more will do here at home; and the sooner we are gone the better we shall be able to impeach them."

Drake was not allowed to sail, but the Queen asked him, "How the forces now in Lisbon might best be distressed?" He replied that the question could not yet be answered, because the intelligence was uncertain, and the resolution of his own people could not be properly understood before going to sea; but that if he were allowed to sail and the enemy came out of Lisbon, they "shall be fought with in such sort as shall hinder his quiet passage to England." When asked what the strength of the fleet should be, he answered, "God increase your most Excellent

Majesty's forces both by sea and land daily." Thus he was clearly in favour of an army, as well as a navy, for preventing an invasion.

Drake's plan gradually prevailed, inasmuch that on April 17 Howard received orders to proceed to Plymouth with the principal ships, and on May 10 the Council resolved that the Western fleet should "be employed as by his Lordship shall be thought meet upon such intelligence as he shall receive from time to time; having care as much as lies in him to impeach any attempt in Ireland, in Scotland, and England." In pursuance of these orders Lord Henry Seymour was left with forty sail, aided by a Dutch squadron, to watch the Duke of Parma. The remainder, under Howard, joined Drake off Plymouth on May 23. The combined fleet, now under the command of the Lord Admiral, with Drake as his chief adviser, consisted of about one hundred sail, and was manned by perhaps ten thousand men.

At this time the English leaders knew that the Spanish fleet was ready to leave Lisbon. They had now to decide on the movements of their own fleet. Drake was for carrying the whole force to the coast of Spain, and at the council of war held on May 25 it was decided to adopt this course at the earliest possible moment. Owing to stress of weather Howard

could not sail until May 30, when he put to sea, but, unable to face the westerly gales, returned on June 6. On the 13th he learned that the Spanish fleet had left Lisbon on May 20. On the 14th he wrote that the bad weather had prevented him sailing, and that Drake, Hawkyns, Frobisher, and others of greatest judgment and experience, concurred with him that "the surest way to meet the Spanish fleet is upon their own coast or in any harbour of their own and there to defeat them." He continued that, as they had put to sea more than three weeks since and had not appeared, he was persuaded that they intended to linger on their own coast. But on the following day he received a despatch from Walsyngham, dated June 9, which, human nature being what it is, may be taken as typical of the sort of letter which an admiral may expect to receive under such circumstances. The letter ran thus:—

"Her Majesty, perceiving by your Lordship's late letters to me that you were minded to repair to the Isles of Bayona [near Vigo on north-west coast of Spain] if the wind serve, there to abide the Spanish fleet or to discover what course they meant to take, doubting that in case your Lordship should put over so far, the said fleet may take some other way, whereby they may escape your Lordship, as by bending their course to the westward to the latitude of 50 degrees, and then to shoot

over to this realm, hath therefore willed me to let your Lordship understand that she thinketh it not convenient that your Lordship should go so far to the south as the said Isles of Bayona, but to ply up and down in some indifferent place between the coast of Spain and this realm, so as you may be able to answer any attempt that the said fleet shall make against this realm, Ireland, or Scotland."

On the 15th Howard replied that the proposal to proceed to the coast of Spain was debated and decided by Drake, Hawkyns, Frobisher, and Fenner, men of the greatest experience: he hopes "her Majesty will not think that we went so rashly to work, or without a principal and choice care and respect of the safety of this realm." He explains the extreme difficulty of covering Scotland, Ireland, and the Channel from a position midway between England and Spain, and the comparative ease of doing so if the fleet were on the Spanish coast: he indicates his intention of attacking the enemy, if they are found at Corunna or other port in Northern Spain.

On June 19 Howard put to sea, but two days later bad weather again drove him into Plymouth. On the 22nd he received a letter from the Council cancelling the orders of June 9, which forbade the fleet moving to the coast of Spain. On the same day the Queen's ships, which had then food for only

three days, completed with provisions to July 20. It is to be noted that during the whole of these operations food played the same part as does coal in the present day. The victuallers were as anxiously looked for then as the colliers are now. The ships never had on board provisions for more than one month, and usually for a much shorter time, so that the movements of the fleet were largely dependent upon this question. Having received intelligence that enemy ships had been seen between Ushant and the Scilly Islands, Howard and Drake put to sea with their whole force on the 24th, and, after a fruitless search, finally took up a position in mid-channel, with Drake and Hawkyns in charge of squadrons towards Ushant and Scilly respectively. This vicious arrangement, which exposed the detached squadrons to be beaten in detail, was maintained until July 4, when Drake again pressed that the fleet should go to the coast of Spain, where, he argued, the Spanish fleet must then be. His reasoning was correct. The Spanish fleet, under Medina Sidonia, had left Lisbon on May 20 for a general rendezvous off the Scilly Islands. Head-winds had much impeded them, with their raw crews and with ships badly found. On June 9 stress of weather forced them into Corunna, where

the bulk of them arrived much demoralised, and with crews weakened by sickness due to bad provisions and scarcity of water. Some of the ships, not being warned, held on for the rendezvous, near which they were sighted, as before related. These would probably have been captured, if the English fleet had been properly provisioned and able to get to sea in time to catch them before they rejoined their admiral.

For nearly a month the Spanish fleet had been lying in Corunna exposed to attack, when, on July 7, Drake at last overcame all opposition to his proposal. Taking advantage of a northerly wind, the whole fleet bore up for the coast of Spain. It was a great resolve; for at this time the ships had nominally provisions for only thirteen days, which meant that, if supplies could not be wrung out of hostile Spain, the risk of starvation would be serious. It was as if, under similar circumstances, ships of the present day were to start with coal for perhaps five days. The wind held favourable for two days and carried them nearly to the Spanish coast, but then unfortunately failed and chopped round to south-west. It is almost certain that, if the fleet had been able to stand on and make the attack, the Spanish expedition would have been annihilated. Being

short of provisions, this was not possible. They were compelled to bear up for Plymouth, where the fleet arrived on the 12th—the very day on which the Armada left Corunna.

Favoured by a south-west wind, the advanced Spanish ships were off the Lizard on Friday the 19th. The news reached Plymouth the same afternoon and was quite unexpected, as no warning reports had been received from the pinnaces left on the coast of Spain or detached to get intelligence. The English fleet were shipping provisions and water, and were completely surprised. They were as much exposed to attack as had been the Spaniards at Corunna, and if Medina Sidonia had been a seaman endowed with the insight and fiery zeal of Drake or Nelson, matters would have gone hard with them. It was as if a modern fleet had been caught in the act of coaling. The event showed the folly of surrendering the offensive—of not following the advice of Drake and attacking the enemy on his own coasts. Fortunately the English leaders fully appreciated the dangers of the situation. The ships immediately began to warp out of port, and working throughout the night the bulk of them were beating out of the Sound in the morning against the south-west wind. By noon the leading ships were near the Eddystone, and

shortly sighted the enemy to the westward. By the following morning they had gained the weather-gauge.

The two fleets, now in sight of each other, were nearly equal in the number of fighting ships. The Spaniards were judged by Drake "to be above a hundred, many great ships, but truly, I think, not half of them men-of-war." The remainder were transports and store ships, which were an impediment to manœuvring and added to their difficulties. The English numbered from eighty to ninety sail, of which from thirty-five to forty were pinnaces and small craft. In actual tonnage the ships of the two fleets did not differ greatly, but the English were lower in the water, more weatherly, faster, and better sea boats. In the vital and important matter of armament the English ships possessed a great advantage. The deliberate policy of Drake and those who were developing the new sailing navy had been to increase the gun power with a view to the adoption of new tactics. They proposed to substitute heavy gun-fire at a distance for the musket, pike, and sword at close quarters. All their changes in the armaments had been made with this object, and had tended to add to the size of the guns and the weight of the broadside. It was this superior fighting power, coupled with superior

skill rather than superior speed, which gave the advantage to the Elizabethan seamen. History is repeating itself, and the tendency now is to increase the size of the gun and the weight of the broadside with a view to increasing decisive ranges.

The whole course of the war showed that the English *personnel* were greatly superior to the Spanish. Not only was this true of the subordinate officers and seamen, but especially so of the leaders. Drake was undoubtedly the greatest seaman of his age, and he was supported by such men as Hawkyns, Frobisher, and Fenner, who were second only to him. The superiority seems to have been largely due to the different spirit which animated the two countries at this time. England was aglow with the spirit of the renaissance. She was the England of Spenser, of Shakespeare, and of Francis Bacon, seething with the spirit of inquiry and of the new learning — the England of individual initiative. On the other hand, Spain embodied the spirit of the counter-reformation, which discouraged inquiry and repressed individuality. Her Government was an autocracy, which interfered in the smallest details and was centralised to an extreme degree, with the result that the control, authority, and responsibility of the executive officers were

weakened, and corruption prevailed to an extent almost beyond belief. The war was, in fact, a struggle between cultured individuality and an ignorant, corrupt despotism, which can be best understood by reference to the almost exact parallel afforded by the recent war between cultured Japan and ignorant Russia.

It has been already explained that, when day broke on the 21st, the English found themselves to windward with the wind at W.N.W. They soon bore down to the attack and concentrated on the windward Spanish ships, which seem to have hauled to the wind on the port tack to receive them. Being faster and more weatherly, the English appear to have ranged past in more or less line ahead, pouring a superior fire into the more slowly moving Spaniards, who, with their inferior gun power and lack of tactical skill, were unable to make an effective reply. Two attacks were made, neither being pressed home, and the English fleet then assumed an expectant attitude to windward. Medina Sidonia's orders were to join Parma, and not to fight Drake unless attacked. He, therefore, now bore up, leaving this unbeaten enemy to follow and harass him. This sealed the fate of the expedition, for its only hope of success lay in first destroying the English fleet.

Howard and Drake followed, ready to pick

up stragglers, or to fight if opportunity offered. On the 23rd there was an action off St Alban's Head, followed by another off Portland on the 24th, and a third off the Wight on the 25th, which last seems to have frustrated any intention they may have had of seizing an anchorage off that island. On the 27th the Armada anchored off Calais. The result of these actions had established the superiority of the English in fighting power. The Spaniards had lost three capital ships, including two flag-ships, and had been so harassed during their retreat that their *moral* must have been seriously impaired. Howard and Drake anchored to windward, and were joined by Seymour with his light division. Medina Sidonia had obeyed Philip's orders: he had joined Parma, and might have overpowered Seymour alone, but so long as Howard was present, and undefeated, Parma could not move.

On the night of the 28th eight improvised fire-ships were sent in and completed the Spanish demoralisation. Medina Sidonia signalled his fleet to cut their cables, which they did. In the morning they were off Gravelines, closely followed by the English, who drove them with great loss into the North Sea, whence such as were not wrecked made their way north-about home to Spain. The Spanish losses were enormous: of the 130 ships which left Corunna 63

were reported as lost; the loss of life was in still greater proportion, and must be reckoned in thousands. The English losses were insignificant: their ships were uninjured, and the number of their killed and wounded amounted to only sixty in all. The disparity and the losses may be usefully compared with those at the recent battle of Tsu Sima.

The leading features of the war between England and Spain 1587-88 have been given in some detail, because the lessons which they teach have been confirmed and extended not only during the Nelsonian era, but by the experience of the steam-propelled navies of the present day. The attempted invasion of Great Britain by Napoleon in 1804-5 bore a striking resemblance to the "enterprise of England" arranged by Philip the Second. The whole resources of France, with assistance from Holland, Belgium, Italy, and Spain, were devoted to the undertaking during more than two years, and were directed by the greatest military genius of the age. The army of Napoleon, like that of Parma, was assembled on the shores of the Channel, at ports where the sea passage would be the shortest and the uncertainties of the voyage the least. For Dunkirk and Nieuport were substituted Boulogne and other

adjacent harbours as ports of embarkation. The transports were again to be small oar-propelled craft, but in much greater numbers, as the invading army was to muster one hundred and thirty thousand men. Like the fleet of Medina Sidonia, the capital ships to cover the passage of the transports across the narrow seas were to come from various Mediterranean and Atlantic ports, among which they were necessarily distributed to obtain facilities for shipbuilding and repair.

To meet and defeat the plans of Napoleon the light squadron of Lord Henry Seymour in the narrow seas found its counterpart in the squadron under Lord Keith, with this important difference—that as ships of the line were to be found in the Dutch ports, corresponding capital ships were placed under his orders. These covered his frigates and sloops, which might otherwise have been driven away by the ships of the line, thus leaving the passage free for the flotilla of transports.

The concentration of the French fleet was prevented by strategy precisely in accordance with the teaching of Drake. The British squadrons maintained a ceaseless watch off the enemy's ports, and "impeached the joining together" of Napoleon's fleets. Nelson off Toulon and Cornwallis off Brest, not to mention others,

stood ready to fight, or to pursue, any ships which put to sea. The result was a striking vindication of the great Elizabethan seaman. In 1587 he had counselled seizing a base and maintaining a squadron on the coast of Spain, with a view to a vigorous offensive. Instead of following his advice a defensive attitude was assumed, with the result that the Spanish navy was allowed to concentrate, and the Armada actually reached the narrow seas. In 1805 his strategy was followed in every particular. Gibraltar was already a British possession, and was of great service as a base for the ships employed in the Mediterranean. The British fleets assumed the offensive, and defeated the enemy before they could concentrate and reach the Channel. In 1588 the British success was largely due to superior armaments and superior skill. In 1805 no such superiority in armaments existed, as the ships were practically equal. Success in this case seems to have been attributable to superior skill arising out of the strategy which, apart from preventing concentration, confined the enemy to his ports. The result was explained by Thucydides in Perikles' speech to the Athenians concerning the Peloponnesians:—

"They will not easily acquire the art of seamanship; even you yourselves, who have been practising ever since the Persian war, are not yet perfect. How can they,

who are not sailors, but tillers of the soil, do much? They will not even be permitted to practise, because a large fleet will constantly be lying in wait for them." If they were watched by a few ships only, they might run the risk, trusting to their numbers and forgetting their inexperience; but if they are kept off the sea by our superior strength, their want of practice will make them unskilful, and their want of skill timid. Maritime skill is like skill of other kinds, not a thing to be cultivated by the way or at chance times: it is jealous of any other pursuit which distracts the mind for an instant from itself."

The recent Russo-Japanese War again confirms with added emphasis the lessons taught by the Armada campaign, and especially the necessity of being ready to assume the offensive by land as well as by sea without delay. In their maritime aspect these two wars bear a striking resemblance. In both cases the possibility of war had been foreseen for some years, and active preparations had been in progress for some months previous to the outbreak of hostilities. Russia underrated the power of Japan as did Spain that of England, and equally failed to make adequate preparations in time. On the other hand, Japan was better prepared than was England in 1588. Not only was her navy more ready, but her army was equally so, and added to her sea power a strength which it is difficult to overestimate.

Japan broke off diplomatic relations on Feb-

ruary 6, 1904. On the same day Togo put to sea from Sasebo with his whole force. About midnight on the 8th-9th the Japanese destroyers attacked the Russian fleet lying outside Port Arthur, and seriously damaged two battleships and a cruiser. The attack was as disastrous to Russia, and as unexpected and far-reaching in its effect, as was Drake's attack on Cadiz. Togo had struck the first blow, and had put into the Mikado and "his people courage and boldness not to fear any invasion in his own country." But he intended to continue "to impeach the provisions" of Russia and to remain on the coast, as Drake recommended but was not allowed to do. To this end he established a base on the coast of Korea, and later nearer to Port Arthur at the Elliot Islands, whence he maintained a vigorous offensive against every ship which issued from Port Arthur. Using ships of all classes for the work to which each was suited, he gradually established such an ascendancy in those seas that Russian ships dare not leave the vicinity of the port. Both destroyers and torpedo boats shared the fate of the battleships, and were eventually "bottled up." While Togo's crews became more skilful and his ships more efficient under the pressure of constant cruising, the Russian officers and men confined

to port deteriorated, and probably lost what little skill and nerve they originally possessed. It was a striking example of the teaching of Drake and of the practice of St Vincent, and proved that the change from sails to steam has not altered the fundamental principles of war.

On February 8, the same day on which the attack on the fleet off Port Arthur was delivered, the Japanese army began to disembark at Chemulpo. These troops were the advanced-guard of the force which ultimately captured Port Arthur and destroyed the Russian fleet. This could not have been done by the navy alone without the help of the army. The destruction of the Russian fleet was a matter of vital importance, because so long as they were capable of fighting Togo had to reckon with them, and this would have added greatly to the difficulty of dealing with the Baltic fleet. Port Arthur fell on January 2, and he was free to devote his whole attention to Rojdesvenski.

Between the conditions previous to the battle of Tsu Sima and those during the Armada expedition the general similarity is striking. On putting to sea the Russians, like the Spaniards, were in difficulties, which showed that they were a mere mob of ships commanded and manned by men unaccustomed to the sea, and unskilled not only in working their guns but in managing

their ships. They were equally encumbered by a number of store ships, colliers, and other non-fighting vessels. Whether Rojdesvenski was ordered to fight, or, like Medina Sidonia, was directed to try to reach Vladivostok without an engagement, is not known. It was probably fear of missing him and doubts as to his own coal-supply, which kept Togo at Tsu Sima. Analogous reasons—for coal substitute provisions—caused Howard to return to Plymouth directly the northerly wind failed him during his dash for the coast of Spain. The accounts of the battle are not yet sufficiently detailed to permit a final judgment, but they indicate that the Russian defeat was primarily due to the same causes as was the defeat of the Armada in 1588—superior gun-fire and superior skill.

This rapid sketch may perhaps suggest the thought that, while an altogether sudden and unexpected attack need not be considered provided ordinary precautions are taken, a serious attempt to invade these islands is an eventuality which may be reasonably expected under certain circumstances. If the object-lesson given by Spain and France in the past, and by Japan in the present, be understood, the assailant will devote his whole resources to the undertaking and much time to preparation. Such an enter-

prise depends for its success on the conditions at the time, and largely on the preparations made to defeat it. Drake evidently thought the danger serious at the time of the Armada. In view of our great naval superiority in 1805, and the arrangements we had made, St Vincent was clear that the French would not be able to cross the Channel at that time. The Japanese have shown the conditions under which an oversea invasion is practicable even in the face of a nominally superior fleet; or, looked at from another point of view, the best manner of preventing it. This has been shown to lie in adequate preparation both of means and plans before the outbreak of war, and in a vigorous offensive by the navy supported by a landing force or army when the time for action arrives. Well-balanced naval opinion will take the view of St Vincent or Drake according as the preparations to defeat the enterprise are complete or otherwise. Those preparations involve a navy large enough to act on the offensive while keeping—as was done in 1588 and 1805—a sufficient force in home waters, together with an army ready to provide and maintain a large expeditionary force.

The control of the water area over which the transports have to pass is the governing factor in any oversea expedition. Both in

1588 and 1805 the area which had to be thus closely watched was very limited, because with a large army it was important to cross the sea at the narrowest part. Sailing ships of war could control these limited waters without difficulty. The use of steam has increased this area, because transports with troops can now be moved with the same certainty from more widely separated ports. But it has equally increased the facilities for watching the wider area. In this case, as in others, the change from sail to steam has neither altered principles nor affected unequally the two opposing forces. Both steam and wireless telegraphy have simply increased the effective sphere of action of a fleet or other naval force. The attack and the defence have gained equally from each. The wide gulf between the steam and sailing navies has no existence in the mind of the thoughtful seaman. Such differences as there may be will be found, on reflection, to be in details rather than in principles. The uncertainties due to the wind were as nothing to the uncertainties of the human element, which in the past, as in the present, exercised a predominant influence on the conduct of war.

The control of this water area in 1588 and 1805 was assured by a special squadron, which held the narrow seas firmly while the main

fleets dealt with the enemy's capital ships. The invading army cannot move until this special squadron is overpowered. Its strength and composition depend upon the force by which it is threatened, as has been already explained in the case of Lord Keith's squadron. That torpedo boats and destroyers alone are not sufficient has been proved by Admiral Togo, who with his combined force of all classes drove the Russian torpedo craft into port, and covered the landing of an army in spite of them. Neither is the untried submarine likely to prove more effective than the torpedo boat and destroyer. Nothing is more to be deprecated than the attempt which has been made to enhance unduly its importance by playing on the credulity of the public, to whom the unknown is always terrible. The new instrument of war has no doubt a value, but that it is anything more than an auxiliary with limited and special uses is difficult to believe.

Mr Balfour told the country that the invasion of these islands is not an eventuality which need be seriously considered. Although our organised fleets were assumed to be absent from home waters, he made no reference to the extreme importance of their offensive action. His argument was really based on a defensive

strategy, depending mainly for its success on the action of the destroyer and submarine. In adopting this attitude he doubtless reflected the opinions of his professional advisers. It is noteworthy that in 1902 the Admiralty laid before the Colonial Conference a "Memorandum on Sea-power and the Principles involved in it," in which occur the following passages:—

"In the foregoing remarks the word *defence* does not appear. It is omitted advisedly, because the primary object of the British Navy is not to defend anything, but to attack the fleets of the enemy, and, by defeating them, to afford protection to British dominions, shipping, and commerce. This is the ultimate aim. To use the word *defence* would be misleading, because the word carries with it the idea of a thing to be defended, which would divert attention to local defences instead of fixing it on the forces from which attack is to be expected. The traditional *rôle* of the British Navy is not to act on the defensive, but to prepare to attack the force which threatens—in other words, to assume the offensive."

This is the strategy of Drake and Togo. The emphasis laid on the defensive in 1905, as compared with the offensive in 1902, is commended to the attention of the reader, who will remark the far-reaching and important consequences involved.

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